The Department of Defense

DoD DEPARTMENTS/AGENCIES:

Department of the Army

Department of the Navy

Department of the Air Force

Defense Advanced Research Projects Agency

Defense Nuclear Agency

Strategic Defen Initiative Organization

DEFENSE SMALL BUSINESS INNOVATION RESEARCH PROGRAM (SBIR)

ABSTRACTS OF PHASE II AWARDS 1986

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PREFACE

During Fiscal Year (FY) 1987 and FY 1988, the Military Services, the Defense Advanced Research Project Agency (DARPA), the Defense Nuclear Agency (DNA), and the Strategic Defense Initiative Organization (SDIO) selected 351 proposals for funding in Phase II of the Small Business Innovation Research (SBIR) Program. These proposals were selected from those submitted by small research and development (R&D) firms awarded Phase I contracts from the FY 1986 solicitation.

In order to make information available on the technical content of the Phase II projects supported by the Department of Defense SBIR Program, this report presents the abstracts of those proposals which have resulted in contract awards. Further, the name and address of each firm performing the work is given for those who may desire additional information about the project.

Venture capital and large industrial firms that may have an interest in the research described in the abstracts in this publication are encouraged to contact the SBIR firm whose name and address are shown. (KR)

INTRODUCTION

On July 22, 1982 the President signed the "Small Business Innovation Development Act of 1982" (Public Law 97-219). This law, effective October 1, 1982, is designed to give small high technology firms a greater share of Federal R&D contract awards.

The Act mandates that all Federal Agencies establish an SBIR program if their FY 1982 extramural budgets for R&D exceeded a threshold figure of $100 million. (There are eleven government agencies meeting this requirement.) Beginning in FY 1983, DoD must make available the following percentages of its extramural R&D budget for this program:

	FY 1983	FY 1984	FY 1985	FY 1986	FY 1987	FY 1988
Percentage (Statutory)	0.1	0.3	0.5	1.0	1.25	1.25
Estimated Dollars	16.7M	43M	79M	160M	204M	221M
Actual Awarded Dollars	20.6M	44.6M	78.2M*	150.7M*	193.7*	

* On January 16, 1986 there was a 5.039 percent deferral or reduction on the FY 1985 and FY 1986 unobligated funds of all programs, program elements, projects, and activities based on the Gramm/Rudman/Hollings Bill. The DoD SBIR budget for FY 1985 was reduced by $1.8 million and by $5.622 million for 1986: OMB Bulletin 86-7, January 16, 1986.

Objectives:

Objectives of the DoD SBIR Program include stimulating technological innovation in the private sector, strengthening the role of small business in meeting DoD research and development needs,

fostering and encouraging participation by minority and disadvantaged persons in technological innovation, and increasing the commercial application of DoD-supported research or research and development results.

The SBIR Program consists of three distinct phases. Under Phase I, DoD components make awards to small businesses, typically of one-half to one man-year effort over a period generally not to exceed six months, subject to negotiation. Phase I is to determine, insofar as possible, the scientific or technical merit and feasibility of ideas or concepts submitted in response to SBIR topics. All DoD topics address specific R&D needs to improve our defense posture. Proposals selected for contract award are those which contain an approach or idea that holds promise to provide an answer to the specific problem addressed in the topic. The successful completion of Phase I is a prerequisite for further DoD support in Phase II.

Phase II awards will be made only to firms on the basis of results from the Phase I effort, and the scientific and technical merit of the Phase II proposal. In addition, proposals which identify a follow-on Phase III funding commitment from non-Federal sources will be given special consideration. Phase II awards will typically cover two to five man-years of effort over a period generally not to exceed 24 months, also subject to negotiation. The number of Phase II awards will depend upon the success rate of the Phase I effort and the availability of funds. Phase II is the principal research or research and development effort, and will require a more comprehensive proposal which outlines the intended effort in detail.

Phase III is expected to involve private-sector investment and support for any necessary development that will bring an innovation to the marketplace. Also, under Phase III, DoD may award follow-on contracts not funded by the SBIR Program for products or processes meeting DoD mission needs.

FY 1986 Program

The SBIR solicitation of Phase I proposals for FY 1986 began with the selection of 760 research and development topic descriptions of need by the Military Services, DARPA, DNA and SDIO. The topics were consolidated into a single DoD solicitation brochure which was distributed on October 1, 1985 and closed on January 31, 1986.

	Number of Topics	Proposals Received	Phase I Awards	Phase II Awards
Army	225	1642	244	86
Navy	190	1222	225	76
Air Force	304	1795	307	132
DARPA	22	177	42	12
DNA	7	171	46	8
SDIO	12	552	154	37
	760	5559	1018	351

Presentation of the technical abstracts which describe the nature of the funded FY 1986 Phase II SBIR projects is the main purpose of this report. Proprietary information is not provided in these abstracts, therefore, technical details may be missing. For this reason, the report supplies the names of individuals in the small business firms who may be contacted should more information be needed on a specific project.

Future Directions of SBIR Program

Public Law 99-443, the "Small Business Innovation Act of 1986" was signed by the President on October 6, 1986. This law reauthorized P.L. 97-219 to extend the sunset clause to 1993; to continue 1.25 percent taxation of the extramural research and development budget; and to exclude from taxation amounts of the DoD research and development budget obligated solely for operational systems development.

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A/G TECHNOLOGY CORP — AF
34 WEXFORD ST
NEEDHAM, MA 02194
CONTRACT NUMBER:
DR ARYE GOLLAN
TITLE:
ADVANCED PERMEABLE MEMBRANE OBIGGS/OBOGS SYSTEM
TOPIC# 94 OFFICE: ASD/XR

THE PHASE I PROGRAM DEMONSTRATED THE FEASIBILITY OF NEWLY DEVELOPED ADVANCED PERMEABLE MEMBRANES FOR THE COMBINED DUTIES ON MILITARY AIRCRAFT OF NITROGEN GENERATION TO INERT FUEL TANKS AND OXYGEN GENERATION FOR PILOT BREATHING IN A UNIQUE SYSTEM ARRANGEMENT. THESE COMPACT AND LIGHT-WEIGHT MEMBRANES LEND THEMSELVES TO A MORE EFFICIENT OBIGGS/OBOGS DESIGN COMBINATION THAN FEASIBLE WITH PREVIOUSLY TESTED MEMBRANCES FOR ON-BOARD AIRCRAFT GAS GENERATION. IN PHASE II PROGRAM OPTIMIZATION OF THE OXYGEN GENERATION PORTION OF THE SYSTEM WILL BE CONDUCTED THROUGH PERFOMANCE MAPPING AND COMPUTER MODELING. THE OXYGEN GENERATING MODES TO BE STUDIED WILL BE MEMBRANE CARTRIDGES AS COLUMNS (I.E., SINGLE STAGE REFLUX SYSTEMS), PRESSURIZED STAGED CARTRIDGE AND A HYBRID "STAGE COLUMN" APPROACH. THE PERFERRED SYSTEM CONFIGURATION WILL BE LIFE TESTED IN A BREAD BOARD UNIT SIZED FOR A TWO MAN CREW. IN ADDITION, MEMBRANCE CARTRIDGE DESIGNS TO FURTHER REDUCE SYSTEM WEIGHT AND VOLUME WILL BE ASSESSED AND SYSTEM DESIGNS FOR LOWER CONCENTRATION OXYGEN SYSTEMS TO IMPROVE NIGHT VISION AT LOWER ALTITUDES WILL BE CONCEPTUALIZED.

ABARIS — NAVY
125 CATRON DR
RENO, NV 89512
CONTRACT NUMBER:
WILLIAM L MURPHY
TITLE:
ASSESSMENT OF FIBER REINFORCED PLASTICS FOR COMBATANT SUBMARINE STRUCTURES
TOPIC# 50 OFFICE: NAVSEA

THE PRESSURE HULL OF A COMBATANT SUBMARINE WOULD BENEFIT FROM THE CHARACTERISTICS OF COMPOSITES, AND THUS IS A GOOD CANDIDATE FOR THE APPLICATION OF THESE MATERIALS. THE TWO CANDIDATE MATERIAL SYSTEMS

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ARE THERMOSETS AND THERMOPLASTICS. THE PROJECT IS TO CONDUCT PRELIMINARY DESIGN STUDIES OF THE PRIMARY HULL STRUCTURE, FRAMES, JOINTS, PENETRATIONS, AND ATTACHMENTS USING GRAPHITE FIBERS AND POLYETHERETHERKETON (PEEK) RESIN. DESIGNS WILL BE ANALYZED FOR STRUCTURAL PERFORMANCE. A SCALE CANDIDATE HULL SECTION WILL BE SELECTED, A DETAIL DESIGN CONDUCTED, AND TEST HULL SCALE SECTIONS WILL BE BUILT. A TEST PLAN WILL BE DEVELOPED, AND A TEST FIXTURE BUILT AND INSTRUMENTED. TESTS WILL BE CONDUCTED AND RESULTS DOCUMENTED. PLAN FOR THE WORK OF A DEMONSTRATION AND VALIDATION PHASE LEADING TO A MILESTONE II AND FULL SCALE ENGINEERING DEVELOPMENT IS OFFERED AS AN OPTIONAL TASK.

ADDMASTER CORP NAVY
2000 S MYRTLE AVE
MONROVIA, CA 91016
CONTRACT NUMBER:
DR JOHN P CLARY
TITLE:
DISTRIBUTED DIGITAL CONTROLLER ARCHITECTURE FOR ADAPTIVE CONTROL
TOPIC# 120 OFFICE: NSWC/SSPO

DIGITAL CONTROL AND SPECIALLY ADAPTIVE CONTROL IS DIFFICULT TO IMPLEMENT FOR VERY HIGH-BANDWIDTH SERVO-LOOP BECAUSE OF THE EXTREMELY HIGH DATA RATES INVOLVED. TO REDUCE THE COMPUTATIONAL BURDEN, THE USUAL COMPROMISING SOLUTION IS TO USE REDUCED ORDER MODELS FOR THE PLANT AND THEN REDUCE THE CLOSED-LOOP SYSTEM'S BANDWIDTH. ADDMASTER'S REPORT SUBMITTED TO THE NAVY UNDER A PHASE I SBIR PROPOSED NEW ARCHITECTURE FOR DIGITAL CONTROLLERS WHICH CAN SUPPORT THE DATA RATES NOW PRESENT AND EXPECTED IN HIGH-BANDWIDTH ADAPTIVE SERVO-LOOPS. THE PROCESSING REQUIREMENTS ARE DISTRIBUTED AMONG AN ARRAY OF INTELLIGENT MODULES, EACH OF WHICH IS CAPABLE OF SEMI-AUTONOMOUS OPERATION. A MICROPROCESSOR BASED SUPERVISOR ADMINISTERS AND MONITORS THE COMPUTATIONAL TASKS OF THE DISTRIBUTED PROCESSORS. THE PHASE I REPORT THE CONCEPTUAL DESIGN OF THE DISTRIBUTED PROCESSING MODULES, ITS ITS SOFTWARE REQUIREMENTS, AND DEMONSTRATIONS OF ITS COMPUTATIONAL THROUGHPUT. ANTICIPATED PHASE II RESULTS ARE A COMPLETED PROTOTYPE (HARDWARE, SOFTWARE, AND SOFTWARE TOOLS) OF A DIGITAL CONTROLLER CAPABLE OF HIGH-BANDWIDTH ADAPTIVE CONTROL.

ADTECH SYSTEMS RESEARCH INC AF
211 N BROAD ST
FAIRBORN, OH 45324
CONTRACT NUMBER: F33615-87-C-5336
SOM R SONI
TITLE:
FAILURE MECHANISMS IN COMPOSITE TURBINE BLADES
TOPIC# 156 OFFICE: AFWAL/ML

SUBMITTED BY DEPT

DETAILED TREATMENT OF THE OPTIMAL LAYER ORIENTATIONS AND STACKING SEQUENCE WITHIN A COMPOSITE TURBINE BLADE REQUIRES THE USE OF APPROXIMATED MODELING TECHNIQUES. SUCH APPROXIMATE METHODS ARE NEEDED BECAUSE OF THE COMPLEXITIES ASSOCIATED WITH THE LARGE NUMBER OF LAYERS AND THE GEOMETRIC CONFIGURATION OF A TWISTED BLADE. TWO MODELS HAVE BEEN DEVELOPED AND MAY BE REGARDED AS FIRST APPROXIMATIONS TO THIS DIFFICULT CLASS OF BOUNDARY VALUE PROBLEMS IN THE THEORY OF ELASTICITY. AN INTERESTING OBSERVATION HAS BEEN MADE REGARDING THE CLASS OF LAMINATES CONSIDERED HERE, I.E., THOSE POSSESSING VERY SMALL VALUES OF WIDTH-TO-THICKNESS RATIO. IN SUCH CASES, THE WIDTH IS INSUFFICIENT TO STIMULATE THE STRESS DISTRIBUTION GIVEN BY CLASSICAL LAMINATION THEORY. THESE POINTS HAVE BEEN DEMONSTRATED BY THE EXAMINATION OF THE FREE EDGE PROBLEM, AS THE WIDTH-TO-THICKNESS RATIO APPROACHES ZERO. THESE MODELS SERVE AS THE BASIS FOR ESTIMATING THE STRENGTH FOR PARTICULAR BLADE GEOMETRY AND LAYER ORIENTATION PARAMETERS, WHICH IN TURN DEFINE AN EXPERIMENTAL CONFIGURATION TO EXAMINE THE QUALITY OF THE MODELS. THE OBJECTIVE OF THE PHASE II EFFORT IS TO EXTEND THE MODELS AND ALGORITHMS FOR HIGHER ORDER EFFECTS (LIKE: TRANSVERSE LOADING, THERMAL LOADING, COATING AND HUB BLADE INTERACTION), AND VALIDATE THE MODELS BY TESTING ACTUAL TURBINE BLADES UNDER GIVEN CONDITIONS.

ADVANCED COMPOSITE PRODUCTS INC AF
PO BOX 653 - 21 COMMERCE DR
NORTH BRANFORD, CT 06471
CONTRACT NUMBER:
DAVID MAASS
TITLE:
MATERIAL AND PROCESS DEVELOPMENT OF NOVEL GRAPHITE/THERMOPLASTIC YARN AND RELATED FORMS
TOPIC# 162 OFFICE: AFWAL/ML

A PHASE I FEASIBILITY STUDY HAS DEMONSTRATED THAT CONFORMABLE THERMOPLASTIC COMPOSITE FABRICS SUCH AS GRAPHITE/PEEK CAN BE USED IN THE FABRICATION OF COMPLEX SHAPED AIRCRAFT STRUCTURAL HARDWARE WITH POTENTIAL FOR SIGNIFICANT LABOR SAVINGS AS COMPARED WITH STANDARD RAW MATERIAL FORMS SUCH AS APC-2. THE EFFORT PROPOSED HEREIN IS DESIGNED TO BUILD ON THAT EXPERIENCE BY FIRST GENERATING A MORE EXTENSIVE DATABASE INVOLVING SIX MATERIAL COMBINATIONS PLUS TEN FABRIC FORMS AND SUBSEQUENTLY FABRICATING THREE REPRESENTATIVE

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PARTS - ONE RADOME AND TWO PIECES OF PRIMARY AIRCRAFT STRUCTURE. DESTRUCTIVE TEARDOWN OF ONE AIRCRAFT PART SHALL BE PERFORMED PLANNED TO DETERMINE PART QUALITY. MONTHLY PROGRESS REPORTS AND A FINAL REPORT ARE PLANNED.

ADVANCED COMPOSITE PRODUCTS INC ARMY
37 WASHINGTON AVE
EAST HAVEN, CT 06512
CONTRACT NUMBER:
DAVID MAASS
TITLE:
LIGHTWEIGHT DURABLE THERMOPLASTIC SANDWICH PANEL ROADWAY SURFACE FOR MILITARY BRIDGE BITE ACCESS/EGRESS DEVELOPMENT
TOPIC# 97 OFFICE: BRDC

A PHASE I FEASIBILITY STUDY HAS DEMONSTRATED THAT THERMOPLASTIC COMPOSITES SUCH AS GLASS/PPS CAN PROVIDE SUBSTANTIAL WEIGHT SAVINGS FOR THE ARMY'S ACCESS/EGRESS ROADWAY SURFACE HARDWARE WHILE ALSO MEETING OPERATIONAL REQUIREMENTS. PRELIMINARY TESTING WAS VERY ENCOURAGING, INDICATING THAT THE SIMPLE, INTEGRALLY MOLDED PANEL DESIGN MET STRUCTURAL AND DURABILITY REQUIREMENTS. THE OBJECTIVE OF THE FULL SCALE DEVELOPMENT ACTIVITY PROPOSED HEREIN IS TO ADVANCE THE COMPOSITE ROADWAY SURFACE HARDWARE FROM THE SUBSCALE FEASIBILITY STAGE, PRODUCTION-READY STATE. THE MAJOR ISSUES TO BE ADDRESSED INCLUDE SCALE-UP OF THE MANUFACTURING PROCESS, DEMONSTRATION/VALIDATION OF A LOW COST, HIGH VOLUME PRODUCTION PROCESS, AND MINOR REDESIGN TO FURTHER OPTIMIZE WEIGHT AND PRODUCTION COST. A TOTAL OF FIVE FULL SIZE (13.1 FEET WIDE X 24" LONG) COMPOSITE ROADWAY SURFACE PANELS ARE TO BE FABRICATED FOR THE ARMY'S EVALUATION.

ADVANCED DECISION SYSTEMS DARPA
1500 PLYMOUTH ST
MOUNTAIN VIEW, CA 94043
CONTRACT NUMBER:
THOMAS C FALL
TITLE:
DISTRIBUTED ELECTRONIC SIGNAL UNDERSTANDING (DESU) II
TOPIC# 22 OFFICE: DARPA

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THIS PROPOSAL ADDRESSES THE DEVELOPMENT OF TECHNIQUES AND ALGORITHMS FOR IDENTIFYING "CRITICAL" NODES FROM COMINT EXTERNALS, AND FOR OPERATING A SPECIFIC ASSOCAITED MULTI-ELEMENT SURVEILLANCE SYSTEM IN A MANNER THAT OPTIMIZES THE SYSTEM EFFECTIVENESS. ANALYSIS TECHNIQUES DEVELOPED AS A RESULT OF THE EFFORT WILL BE GENERALLY APPLICABLE TO THE PROBLEM OF AUTOMATICALLY EXPLOITING COMINT EXTERNALS INFORMATION IN SUPPORT OF SITUATION ASSESSMENT AND TARGETING. A PROTOTYPE THAT DEMONSTRATES THE FEASIBILITY OF THE DEVELOPED TECHNIQUES FOR ANALYSIS AND CONTROL OF THE SPECIFIC SURVEILLANCE SYSTEM WILL BE IMPLEMENTED. THIS PROTOTYPE WILL FURTHER PROVIDE MECHANISMS FOR EVALUATING AND MEASURING THE PERFORMANCE OF SURVEILLANCE SYSTEM CONFIGURATIONS, AND FOR IDENTIFYING CRUCIAL ALLOCATIONS, PARAMETERS, AND TRADES REQUIRED IN SYSTEM ANALYSES AND ACQUISITIONS. THE PHASE I DESU EFFORT IDENTIFIED AND ELABORATED AN OBJECT-ORIENTED, JUSTIFICATION-BASED DISTRIBUTED PROCESSING ARCHITECTURE, USING SIMILAR TECHNIQUES DEVELOPED FOR THE PENDRAGON SYSTEM, AUGMENTING THEM WITH OPERATIONS CONTROL CONCEPTS DEVELOPED IN THE IRM PROJECT, AND INCORPORATING COMINT EXTERNALS EXPLOITATION TECHNIQUES DEVELOPED IN IRM.

ADVANCED DECISION SYSTEMS AF
201 SAN ANTONIO CIR - STE 286
MOUNTAIN VIEW, CA 94040
CONTRACT NUMBER: F33615-87-C-1545
DAVID L MILGRAM
TITLE:
HYPOTHESIS MANAGEMENT FOR SYMBOLIC RF SIGNATURE PREDICTION
TOPIC# 113 OFFICE: AFWAL/AA

PHASE I RESULTS HAVE LED TO THE CONCLUSION THAT A SINGLE THEORY OF HYPOTHESIS MANAGEMENT CAN UNIFY MANY EXISTING APPROACHES TO MODEL-BASED OBJECT RECOGNITION. THE WORK PROPOSED FOR PHASE II WILL DELINEATE A UNIFIED APPROACH TO HYPOTHESIS MANAGEMENT FOR MODEL-BASED OBJECT RECOGNITION. THIS APPROACH EMPLOYS A SINGLE, GENERAL CERTAINTY CALCULUS TO RELATE THE VARIOUS PREDICTIONS ARISING FROM THE SCENE CONTENT, THE GEOMETRIC OBJECT MODELS, THE E-M PHYSICS OF SCATTERING AND THE SENSOR/PLATFORM MODELS. BY COMBINING THESE MODELS IN AN EVIDENTIAL ACCRUAL FRAMEWORK, A COMPLETE (PROBABILISTIC) REPRESENTATION OF THE SYMBOL/SIGNAL RELATIONSHIP IS POSSIBLE. THIS APPROACH WILL BE SIMULATED AND TESTED AGAINST A NUMBER OF IMPORTANT

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MODELS AND VARIATIONS ON THEM. IN PARTICULAR, THE THEORY BEHIND THIS APPROACH WILL NEED TO ESTIMATE PREDICTIVE ACCURACY NOT ONLY FOR MODELS AS CURRENTLY IMPLEMENTED, BUT ALSO FOR FUTURE EXTENSIONS TO THE MODELS. IN THIS REGARD, GEOMETRIC OBJECT MODELS AND E-M MODELS WHICH CAN REPRESENT VIBRATION, MOTION, ARTICULATION, MODIFICATION, MULTI-OBJECT ADJACENCY, ETC, WILL ALSO BE STUDIED.

ADVANCED DECISION SYSTEMS ARMY
201 SAN ANTONIO CIR - STE 286
MOUNTAIN VIEW, CA 94040
CONTRACT NUMBER:
DR JAY GLICKSMAN
TITLE:
SPATIAL DATA STRUCTURES FOR ROBOTIC VEHICLE ROUTE PLANNING
TOPIC# 186 OFFICE: ETL/COE

THE RESEARCH AND TESTBED DEVELOPMENT IN PHASE II LEADS NATURALLY TO THE DESIGN AND DEVELOPMENT OF A SOPHISTICATED SPATIAL DATA OBJECT PROGRAMMING ENVIRONMENT, THE SPATIAL DATA STRUCTURE DEVELOPMENT SYSTEM (SDSDS). USING THIS ENVIRONMENT, PROGRAMMERS DEVELOPING TERRAIN APPLICATIONS CAN FOCUS ON THE SEMANTICS OF THE APPLICATION ITSELF AND NOT ON THE DETAILS OF WHAT DATA STRUCTURES HAPPEN TO BE USED FOR THE REPRESENTATION OF SPATIAL DATA INFORMATION. THE SDSDS THEREBY BECOMES A CRITICAL COMPONENT IN TERRAIN APPLICATION DESIGN AND DEVELOPMENT. MANY DIFFERENT FIELDS ARE INVOLVED IN TERRAIN ANALYSIS AND THE LARGER AREA OF SPATIAL DATA REPRESENTATIONS, INCLUDING THE FIELDS OF: AUTOMATIC ROUTE PLANNING AND NAVIGATION, TACTICAL PLANNING, PERCEPTUAL PREDICTION, AERIAL PHOTOGRAPH AND SATELLITE IMAGERY ANALYSIS; LAND MANAGEMENT; CARTOGRAPHY, COMPUTER GRAPHICS, SIGNAL UNDERSTANDING, MODELING, SEISMIC INTERPRETATION, METEOROLOGY, CAD/CAM, AND NON-INVASIVE MEDICAL IMAGE ANALYSIS (CT, NMR, PETT). THE TESTBED TO BE DEVELOPED IN THIS PROPOSED PHASE II ITSELF PROVIDES A USEFUL FACILITY TO RESEARCHERS AND SYSTEM DEVELOPERS USING SPATIAL DATA STRUCTURES IN A VARIETY OF DIFFERENT FIELDS, BOTH COMMERCIAL AND GOVERNMENTAL. THE TESTBED ALLOWS THE RESEARCHER/DEVELOPER TO EASILY PROTOTYPE AND TEST NEWLY DESIGNED ALGORITHMS AND APPROACHES. THE DATA PROVIDED FROM THE STUDIES PERFORMED IN PHASE II PROVIDE INFORMATION USEFUL IN MOST EFFECTIVELY USING THE TESTBED. THE WORK INTENDED FOR PHASE III WOULD EXTEND THE UTILITY OF THE TESTBED FURTHER BY ALLOWING PROTOTYPING TO

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PROCEED EVEN MORE RAPIDLY BY AUTOMATICALLY SELECTING DATA STRUCTURES, METHODS, AND PROCESSING FLOWS FOR THE RESEARCHER/DEVELOPER, ALLEVIATING THE BURDEN OF KEEPING TRACK OF IMPLEMENTATIONAL AND EFFICIENCY DETAILS.

ADVANCED FIBEROPTICS CORP ARMY
7650 E EVANS RD
SCOTTSDALE, AZ 85260
CONTRACT NUMBER:
DR ALBERT H WEY
TITLE:
DIRECT GROWTH/FUSION CIRCUITRY DEVICES ON OPTICAL FIBER
TOPIC# 49 OFFICE: CECOM/AMSEL

DIRECT DEPOSITION OF COMPOUND SEMICONDUCTOR GaAs FILM INTO A SILICA OR SAPPHIRE GLASS HAS BEEN STUDIED TO BE A POTENTIAL TECHNIQUE IN FABRICATING OPTO CIRCUITRY DEVICES ON OPTICAL FIBER IN PHASE I. IN THIS PHASE II, AFC PROPOSES AN INTENSIVE RESEARCH OF HOW TO GROW III-V EPITAXY FIL ON GLASS SUBSTRATE USING MBE (MOLECULAR BEAM EPITAXY) WITH SURFACE LASER ANNEALING TECHNIQUE, AND ICBT (ION CLUSTERED BEAM TECHNOLOGY), AND MOVPE (METAL-ORGANO VAPOR PHASE EPITAXY) TECHNIQUES. MECHANICAL, ELECTRICAL AND OPTICAL PROPERTIES WILL BE ANALYZED AND CHARACTERIZED WITH EVERY AVAILABLE TECHNIQUE. SIMPLE STRUCTURE OPTO-DEVICES WILL BE FABRICATED AND TESTED. THE FINAL GOAL OF THIS PROJECT IS TO FULLY INTEGRATE OPTO CIRCUITRY FOR HIGH SPEED OPTO-PROCESSING AND COMMUNICATION.

ADVANCED MATERIALS LAB INC NAVY
242 BAKER AVE
CONCORD, MA 01742
CONTRACT NUMBER:
DR THOMAS L ALTSHULER
TITLE:
BEHAVIOR OF METAL MATRIX COMPOSITES AT CRYOGENIC TEMPERATURES
TOPIC# 112 OFFICE: NSWC/SSPO

METAL MATRIX COMPOSITES THAT MAY BE USED IN DEEP SPACE VEHICLES MIGHT BE SUBJECTED TO CRYOGENIC TEMPERATURES NEAR ABSOLUTE ZERO IN DEEP SPACE. THESE COMPOSITES DEVELOP LARGE INTERNAL STRESSES DUE TO

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THE DIFFERENTIAL THERMAL EXPANSION OF THE FIBERS AND THE MATRIX METAL. IT IS NECESSARY TO KNOW THE ULTIMATE BREAKING STRENGTH, THE MODULUS OF ELASTICITY, THE THERMAL EXPANSION COEFFICIENT, AND OTHER MECHANICAL CHARACTERISTICS OF THESE MATERIALS FOR PROPER SELECTION AND DESIGN WITH THEM. THIS RESEARCH WILL OBTAIN THE NECESSARY TEST DATA FOR THESE PARAMETERS FOR VARIOUS METAL MATRIX COMPOSITES INCLUDING THOSE THAT HAVE BEEN RADIATION DAMAGED. RESEARCH WILL ALSO BE CONDUCTED TO SEE THE INTERFACIAL BOUNDARY BETWEEN THE FIBERS AND THE METAL MATRIX USING A SCANNING TUNNELING MICROSCOPE.

ADVANCED REFRACTORY TECHNOLOGIES INC SDIO
699 HERTEL AVE
BUFFALO, NY 14207
CONTRACT NUMBER:
DR PETER SHAFFER
TITLE:
SYNTHESIS OF ULTRAHIGH PURITY SUBMICRON BORON CARBIDE POWDERS
TOPIC# 11 OFFICE:

THE TECHNICAL FEASIBILITY HAS BEEN DEMONSTRATED OF PRODUCING FINE (SUBMICRON), PURE BORON CARBIDE POWDER FROM THE CRUDE HIGH TEMPERATURE ROTARY FURNACE PRODUCT. AN AGGLOMERATED, CARBON RICH BORON CARBIDE WAS SHOWN TO BE CAPABLE OF CONVERSION TO A FINE, PURE, NUCLEAR GRADE POWDER WITHOUT MAJOR LOSSES OF THE BORON CARBIDE VALUES. THIS FINISHED POWDER, HOWEVER, HAS NEVER BEEN SYNTHESIZED IN COMMERCIAL QUANTITIES AND MAY HAVE UNUSUAL PROPERTIES AND CHARACTERISTICS IN FABRICATED FORM. TO ADDRESS THIS NEED, COMMERCIAL SCALE PRODUCTION OF THE FINISHED BORON CARBIDE (B4C) POWDER IS BEING DEMONSTRATED AND THE FABRICABILITY DETERMINED BY CARRYING OUT PARAMETRIC DENSIFICATION STUDIES. THE REACTIVITY OF THE POWDER IS BEING STUDIED IN VARIOUS COMPOSITES. THE PHYSICAL, MECHANICAL, CHEMICAL, THERMAL, AND ELECTRICAL PROPERTIES OF COMPONENTS FABRICATED FROM THE B4C PRODUCT ARE BEING DETERMINED. COMMERCIALLY AVAILABLE, HIGH PURITY, SUBMICRON B4C POWDER WILL ENHANCE THE PERFORMANCE AND ECONOMICS OF FABRICATED PARTS FOR SPACECRAFT ANTENNA STRUCTURES, CERAMIC ARMOR PLATE, DISPERSION STRENGTHENED METALS, WEAR RESISTANCE COMPONENTS, METAL MATRIX COMPOSITES, AND CUTTING TOOL COMPONENTS.

ADVANCED REFRACTORY TECHNOLOGIES INC NAVY
699 HERTEL AVE
BUFFALO, NY 14207
CONTRACT NUMBER:
DR PETER T B SHAFFER
TITLE:
IMPROVED MATERIALS FOR CERAMIC ARMOR FABRICATION
TOPIC# 118 OFFICE: NSWC/SSPO

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CONTINOUS, DIRECT, COMMERCIAL SCALE PRODUCTION OF REFRACTORY SOLID SOLUTION POWDERS HAS BEEN DEMONSTRATED. SUCH MATERIALS HAVE BEEN SHOWN TO HAVE UNIQUE, UNEXPECTED, AND POTENTIALLY USEFUL PROPERTIES. IN PHASE II, WE PROPOSE TO SCALE UP THE SOLID-SOLUTION POWDER SYNTHESIS, TO OPTIMIZE THE PROPERTIES OF THE POWDERS (PURITY AND PARTICLE SIZE) FOR FABRICATION, AND TO EVALUATE, THROUGH CHARACTERIZATION, FABRICATION AND BALLISTIC TESTING, SEVERAL OF THESE SOLID-SOLUTION SYSTEMS. IN ADDITION TO COMMERCIAL SCALE PRODUCTION OF THE POWDERS, WE WILL FABRICATE TEST PARTS AND EVALUATE THEIR PHYSICAL, MECHANICAL, AND THERMAL PROPERTIES. ADDITIONALLY, WE WILL PRODUCE PLATE MATERIALS FOR BALLISTIC EVALUATION. CONCURRENT TO THE INVESTIGATION OF ALREADY IDENTIFIED SOLID-SOLUTION SYSTEMS, WE WILL CONTINUE TO EXPLORE AND EVALUATE OTHER SYSTEMS, ESPECIALLY EUTECTIC SYSTEMS, WHICH WE BELIEVE MAY HAVE STRONG POTENTIAL FOR DEFENSE APPLICATIONS.

ADVANCED RESEARCH & APPLICATIONS CORP SDIO
1223 E ARQUES AVE
SUNNYVALE, CA 94086
CONTRACT NUMBER:
L N KOPPEL
TITLE:
ADVANCED SOLID STATE NEUTRON DETECTOR DEVELOPMENT FOR NEUTRAL PARTICLE BEAM (NPB) MASS DISCRIMINATION
TOPIC# 3 OFFICE:

THE ASSEMBLY OF A FAST NEUTRON SENSOR BASED ON ADVANCED METAL-OXIDE-SILICON CAPACITOR (MOSC), SOLID-STATE, DETECTOR TECHNOLOGY HAS BEEN SHOWN TO BE FEASIBLE. THE MOSC SENSOR PROMISES TO BRING TO THE INTERACTIVE DISCRIMINATION MISSION OF THE STRATEGIC DEFENSE SENSOR SYSTEM THE BENEFITS OF SUPERIOR TECHNICAL PERFORMANCE, READY SPACE QUALIFICATION, AND COST-EFFECTIVENESS. FURTHER RESEARCH ACTIVITIES ARE BEING UNDERTAKEN TO QUALIFY THE MOSC RADIATION SENSOR AS A COMPONENT OF THE NEUTRAL PARTICAL BEAM (NPB) INTEGRATED EXPERIMENT. MOSC TECHNOLOGY-BASED SCALING EXPERIMENTS ARE BEING EXECUTED; AND THE SYSTEM-LEVEL IMPLICATIONS OF THE MOSC SENSOR CONCEPT BEING EVALUATED. A PROTOTYPE MOSC RADIATION SENSOR PACKAGE IS BEING CONSTRUCTED AND EXPERIMENTALLY DEMONSTRATED; AND A SPACE-QUALIFIED SENSOR IS BEING DESIGNED. THIS EFFORT, WHEN SUCCESSFUL, WILL PROVIDE A SUBSTANTIAL FOUNDATION FOR PARTICIPATION

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OF THE MOSC INTERACTIVE DISCRIMINATION SENSOR IN THE NPB INTEGRATED EXPERIMENT. COMMERCIAL APPLICATION OF THE SENSOR FOR PERSONNEL RADIATION PROTECTION MAY BE POSSIBLE.

ADVANCED ROTORCRAFT TECHNOLOGY INC ARMY
1804 STIERLIN RD - STE 210
MOUNTAIN VIEW, CA 94043
CONTRACT NUMBER:
DR RONADL W Du VAL
TITLE:
A REAL-TIME BLADE ELEMENT ROTORCRAFT SIMULATION DEVELOPMENT
TOPIC# 42 OFFICE: AVSCOM/AMSAV

THE COMPUTATIONALLY INTENSE NATURE OF BLADE ELEMENT ROTORCRAFT MATH MODELS HAS LIMITED THEIR USE IN REAL-TIME SIMULATIONS TO LARGE MAINFRAME COMPUTERS OR SPECIAL PURPOSE COMPUTER SYSTEMS. BLADE ELEMENT MODELS ARE, HOWEVER NECESSARY TO ACCURATELY REPRODUCE THE ROTORCRAFT RESPONSE DURING COMPLEX MANEUVERS, SUCH AS THOSE REQUIRED FOR HELICOPTER AIR-TO-AIR COMBAT AND TERRAIN FOLLOWING - TERRAIN AVOIDANCE. ADVANCED ROTORCRAFT TECHNOLOGY, INC. (ART) HAS DEVELOPED A METHODOLOGY FOR RESTRUCTURING EXISTING SERIAL SIMULATION CODES TO RUN IN PARALLEL ON MULTIPLE CPUs. UNDER THE PHASE I SBIR CONTRACT THIS METHODOLOGY WAS AUTOMATED, USING A MICRO VAX II COMPUTER SYSTEM RUNNING MICRO VMS. THE RESULTING DEVELOPMENT SYSTEM WAS THEN USED TO DESIGN AND EVALUATE PARALLEL ARCHITECTURES FOR AN EXISTING SERIAL SIMULATION OF THE RSRA/X-WING. A PROTOTYPE HARDWARE CONFIGURATION TO IMPLEMENT THIS ARCHITECTURE WAS THEN SELECTED AND SHOWN TO BE CAPABLE OF ACHIEVING THE SPECIFICATIONS FOR REAL-TIME OPERATIONS. UNDER THE PROPOSED PHASE II SBIR CONTRACT, THE PROTOTYPE SYSTEM DESIGNED IN PHASE I WILL BE IMPLEMENTED AND TESTED, USING THE DEVELOPMENT SYSTEM TO MONITOR THE PERFORMANCE. A UH-60 (BLACKHAWK) VERSION OF THE PARALLEL PROCESSING BLADE ELEMENT SIMULATION WILL ALSO BE DESIGNED AND THE INTERFACE REQUIREMENTS TO LINK THIS REAL-TIME SYSTEM TO AN EXISTING SIMULATION FACILITY AT NASA'S AMES RESEARCH CENTER WILL BE EVALUATED.

AERODYNE PRODUCTS CORP AF
45 MANNING RD
BILLERICA, MA 01821
CONTRACT NUMBER:
MORTON CAMAC
TITLE:
MOSAIC INFRARED SCENE SIMULATOR
TOPIC# 291 OFFICE: AEDC/DOT

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AERODYNE WILL SUPPLY AEDC SEVERAL ABOVE-THE-HORIZON BACKGROUND SCENES TO BE EMPLOYED IN THE AEDC LOW TEMPERATURE INFRARED SIMULATION FACILITY. INFRARED BACKGROUNDS CONSIST OF STARS AND ZODIACAL LIGHT. THE NON-UNIFORM INTENSITY DISTRIBUTION OF THE ZODIACAL LIGHT WILL BE EMPHASIZED AND WILL BE SIMULATED BY SINUSOIDAL INTENSITY BANDS OF 3, 10 AND 30 CYCLES PER DEGREE. INFRARED STARS BACKGROUND ARE SIMULATED FOR THE GALACTIC CENTER, ALONG THE GALACTIC PLANE AND 15 DEG FROM THE PLANE. THE AERODYNE SCENE IS PRODUCED BY BLACKBODY RADIATION DIFFRACTION FROM A GRATING OVERCOATED WITH A HIGHLY REFLECTIVE METAL LAYER. THE INFRARED SENSOR ONLY OBSERVES THE BLACKBODY RADIATION DEFRACTED INTO FIRST ORDER. ASIDE FROM THE 1 cm/sq BLACKBODY AT 300 DEG K, THE REST OF THE COMPONENTS ARE AT THE CRYOGENIC TEMPERATURES AMD DP MPT RADOATE OM TJE 10 um SPECTRAL REGION.

AERODYNE RESEARCH INC AF
45 MANNING RD
BILLERICA, MA 01821
CONTRACT NUMBER: FQ8671-8601298
DR CHARTER STINESPRING
TITLE:
LASER INDUCED SURFACE CHEMICAL EPITAXY
TOPIC# 7 OFFICE: AFOSR/XOT

THIS PROPOSAL DESCRIBES RESEARCH WHICH WILL AID IN THE DEVELOPMENT OF A NEW THIN FILM DEPOSITION TECHNIQUE, LASER-INDUCED SURFACE CHEMICAL EPITAXY (LSCE). THIS TECHNIQUE UTILIZES THERMAL AND PHOTON-INDUCED SURFACE CHEMISTRY OF ADSORBED ORGANOMETALLIC MOLECULES AND COMBINES MANY OF THE BENEFITS OF ORGANOMETALLIC CHEMICAL VAPOR DEPOSITION (OMCVD) AND MOLECULAR BEAM EPITAXY (MBE). THE PHASE I STUDIES WHICH LED TO THIS PROPOSAL DEMONSTRATED ASPECTS OF THE PHOTON-INDUCED SURFACE CHEMISTRY AND IDENTIFIED ADDITIONAL ISSUES TO BE ADDRESSED IN PHASE II. THE SPECIFIC OBJECTIVES OF THE PHASE II WORK ARE TO ESTABLISH THE SCIENTIFIC BASIS OF LSCE OF CdTe ON GaAs AND TO DEMONSTRATE THIS PROCESS. THIS WILL INVOLVE STUDIES OF THERMAL AND PHOTON-INDUCED SURFACE CHEMISTRY AS WELL AS STUDIES OF CdTe EPITAXY ON GaAs.

AEROMET INC AF
PO BOX 701767
TULSA, OK 74170
CONTRACT NUMBER:
MARK L BRADFORD
TITLE:
DEVELOPMENT OF AEROMET "CLEARSKY" THREE-DIMENSIONAL HIERARCHICAL REAL-TIME CLOUD MODELING SYSTEM
TOPIC# 195 OFFICE: BMO/MYSC

1

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THIS PROPOSAL DESCRIBES THE DEVELOPMENT OF A REAL-TIME, THREE-DIMENSIONAL CLOUD MODELING SYSTEM, THE "CLEARSKY" SYSTEM. A MODELING SYSTEM WILL BE DEVELOPED TO ENHANCE THE ABILITY TO FORECAST WEATHER WHICH AFFECTS AIR FORCE WEAPONS SYSTEMS TESTS AT THE U.S. ARMY KWAJALEIN ATOLL (USASK). DEVELOPMENT, TESTING, EVALATION AND DOCUMENTATION OF A MODEL HIERARCHY COMPOSED OF A NON-HYDROSTATIC CLOUD MODEL FOR EXPLICIT CLOUD FORECASTS, A NESTED MESOSCALE MODEL FOR FORECASTING THE HYDROSTATIC ENVIRONMENT, UNDER WHICH THE CLOUD MODEL WILL OPERATE, AND GLOBAL MODEL DATA WILL BE PERFORMED.

ALABAMA CRYOGENIC ENGINEERING INC NAVY
PO BOX 2451
HUNTSVILLE, AL 35804
CONTRACT NUMBER:
JOHN B HENDRICKS
TITLE:
A COMPACT MONOLITHIC LINDE-HAMPSON CRYOCOOLER FOR 20 KELVIN
TOPIC# 131 OFFICE: NWC/NAVAIR

THIS PROPOSED EFFORT COVERS THE FABRICATION OF A LINDE-HAMPSON CRYOCOOLER CAPABLE OF REACHING 20 K. THE CRYOCOOLER USES TWO STAGES. THE FIRST STAGE FLUID IS NITROGEN, THE SECOND STAGE FLUID IS HYDROGEN. THE CRYOCOOLER WILL PRODUCE 0.75 WATT OF COOLING POWER AT 20 K. WITH A SECONDARY NITROGEN COOLING LOOP IN THE FIRST STAGE, THE CRYOCOOLER HAS A PREDICTED COOLDOWN TIME OF LESS THAN 2 SECONDS. THE CRYOCOOLER HAS A PREDICTED RUN TIME OF 10 MINUTES WITH A NITROGEN GAS VOLUME OF 25 IN(3) AND A HYDROGEN GAS VOLUME OF 6 IN(3). THE CRYOCOOLER USES AN INNOVATIVE FABRICATION TECHNIQUE, THAT YIELDS A "MONOLITHIC" STRUCTURE. THIS STRUCTURE CAN WITHSTAND HIGH SHOCK AND VIBRATION LOADING WITHOUT DAMAGE. THE FABRICATION TECHNIQUE IS INTRINSICALLY HIGH VOLUME, AND SHOULD YIELD SUBSTANTIAL COST SAVINGS IN HIGH VOLUME PRODUCTION COMPARED TO THE CURRENT TECHNOLOGY.

AMERICAN HY-PERFORM INC NAVY
412 S PERTH ST
PHILADELPHIA, PA 19147
CONTRACT NUMBER:
DR W NOVIS SMITH
TITLE:
ABRASION RESISTANT NON-FLAMMABLE OXIDIZED POLYACRYLONITRILE FABRICS
TOPIC# 73 OFFICE: NAVSUP

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A SERIES OF FABRICS BASED ON BLENDED OPF YARNS HAVE BEEN DEVELOPED WHICH DEMONSTRATE SUPERIOR INHERENT FIRE PROTECTION OVER CURRENTLY USED FABRICS FOR STANDARD NAVY PROTECTIVE CLOTHING. THESE FABRICS ALSO HAVE SATISFACTORY ABRASION RESISTANCE (60 TO 110% OF WOOL FABRIC) AND ENHANCED CHEMICAL AND STAINING RESISTANCE. PHASE I OF THIS PROGRAM HAS SHOWN THAT OPF CONTAINING FABRICS CAN BE MADE WITH SATISFACTORY ABRASION RESISTANCE WHILE RETAINING THEIR SUPERIOR FIRE RESISTANCE THROUGH SELECTED CHOICE OF BLENDED YARNS OF OPF AND OTHER FIBERS. THE FR PERFORMANCE ON ALL FABRICS GAVE AN AFTER FLAME ON FEDERAL TEST NO. 5903 FROM LESS THAN ONE SECOND TO ZERO WITH EXCELLENT HAND AND COMFORT AT ABOUT THE SAME PRICE OAS NOMEX(R) FABRICS. PHASE II WILL DEVELOP THREE OPTIMIZED FABRICS BASED ON THE RESULTS FROM PHASE I. THESE FABRICS WILL BE: 1) MAXIMUM FR WITH GOOD ABRASION AND TEAR STRENGTH FOR OUTER FIREFIGHTERS PROTECTION; 2) MAXIMUM FR WITH GOOD ABRASION, DARK COLOR AND GOOD HAND; 3) MAXIMUM FR KNIT FOR A SUPPORT FABRIC FOR ALUMINIZED FILMS; AND 4) (OPTIONAL) LIGHT WEIGHT KNIT WITH GOOD COMFORT WITH MAXIMUM FR FOR UNDERWEAR. VARIOUS YARNS AND WEAVE COMBINATIONS WILL BE EVALUATED IN THE FIRST NINE MONTHS OF THE PROGRAM FOLLOWED BY A DECISION TO GO FOR SEVERAL FIELD TRIALS WITH THE BEST FABRIC CANDIDATES. THE COMPLETION OF PHASE II WILL RESULT IN PRELIMINARY SPECIFICATIONS WRITTEN FOR NEW NAVY REQUIREMENT FOR SEVERAL DIFFERENT GARMENTS IN HIGH RISK FIRE AREAS.

AMERICAN RESEARCH CORP OF VA AF
PO BOX 3406 - 642 FIRST ST
RADFORD, VA 24143
CONTRACT NUMBER:
DR R J CHURCHILL
TITLE:
LASER FIBER OPTIC SENSOR FOR HUMAN BIOMAGNETIC MEASUREMENTS
TOPIC# 278 OFFICE: AMD/RDO

BIOMAGNETIC MEASUREMENTS CAN PROVIDE UNIQUE CONTRIBUTIONS TO THE STUDY OF THE HUMAN PHYSIOLOGICAL CONDITION. PRESENTLY THESE MEASUREMENTS ARE MADE WITH SUPERCONDUCTING QUANTUM INTERFERENCE DEVICE (SQUID) MAGNETOMETERS WHICH ARE USUALLY LIMITED TO LABORATORY AND CLINICAL USE. TO PERMIT THE EVALUATION OF HUMAN BIOMAGNETIC FIELDS UNDER MISSION CONDITIONS, THIS PROGRAM INVOLVED THE DEVELOPMENT OF RELIABLE, COMPACT, ROOM TEMPERATURE, SENSITIVE, MAGNETOMETER BASED

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ON FIBER OPTIC INTERFEROMETRIC SENSORS. DURING THE PHASE I EFFORT, A FIBER OPTIC INTERFEROMETER WITH MAGNETOSTRICTIVE FIELD SENSING ELEMENTS WAS DESIGNED, FABRICATED, TESTED AND FOUND TO HAVE A DETECTION SENSITIVITY OF 10 TO THE -9TH POWER TESLA PER METER OF FIBER. THE RESULTS OF THE PHASE I PROGRAM SHOWED THAT SPECIFIC FIBER-TO-MAGNETOSTRICTIVE MATERIAL BONDING TECHNIQUES CAN IMPROVE SENSITIVITY AND THAT THE SIGNAL-TO-NOISE RATIO OF THE MAGNETOMETER CAN BE IMPROVED BY OPTOELECTRONIC MODIFICATIONS. THE OVERALL OBJECTIVE OF THE PHASE II PROGRAM IS THE DEVELOPMENT OF A PROTOTYPE FIBER OPTIC MAGNETOMETER TO MEASURE MAGNETIC FIELDS EMANATING FROM ORGANS OF THE HUMAN BODY. THE EFFORT TO ACHIEVE THIS OBJECTIVE WILL INCLUDE EXTENSION OF MAGNETOSTRICTIVE/FIBER MATERIAL INTERACTION THEORY, IMPROVEMENT IN INTERFEROMETER DESIGN TO REACH AN ULTIMATE SENSITIVITY OF 10 TO THE -16TH TESLA, EVALUATION OF METHODS TO INCREASE THE MAGNETOSTRICTION-TO-OPTICAL-FIBER STRAIN TRANSFER EFFICIENCY, INTEGRATION OF HYBRID MICRO-OPTOELECTRONIC MAGNETOMETERS, ACQUISITION OF BIOMAGNETIC TEST DATA UNDER LABORATORY AND SIMULATED MISSION CONDITIONS AND OPTIMIZATION OF A PROOF-OF-CONCEPT SYSTEM. THIS SHOULD RESULT IN THE ESTABLISHMENT OF TECHNICAL SPECIFICATIONS FOR ENGINEERING MODELS TO BE FABRICATED IN PHASE III OF THE PROGRAM.

AMERICAN RESEARCH CORP OF VA DARPA
PO BOX 3406 - 642 FIRST ST
RADFORD, VA 24143
CONTRACT NUMBER:
DR M G NIIMURA
TITLE:
MINIATURE ELECTRON BEAM ACCELERATORS INCORPORATING ELECTRON SOURCE AND HIGH GRADIENT ACCELERATION
TOPIC# 18 OFFICE: DARPA

THE DEVELOPMENT OF COMPACT, ULTRAHIGH CURRENT, RELATIVISTIC ELECTRON BEAM ACCELERATORS IS ESSENTIAL FOR SPACEBORN DEFENSE SYSTEMS BECAUSE STATE-OF-THE-ART SYSTEMS ARE TOO LARGE AND HEAVY FOR PRACTICAL APPLICATION. THE PHASE I PROGRAM SUCCESSFULLY DEMONSTRATED A PROTOTYPE OF A LIGHTWEIGHT, MINIATURE ELECTRON BEAM ACCELERATOR (MEBA) WITH THE NOMINAL BEAM CAPACITY OF 1 MeV (100 MeV/m), 10 KA (2-200ns). THIS PROTOTYPE USED AN EXTERNAL COAXIAL INDUCTOR AND A DENSE PLASMA FOCUS DPF DEVICE AS BOTH THE OPENING SWITCH AND THE E-BEAM "DIODE." IMPROVED PERFORMANCE OF BEAM PROPAGATION WAS OBSERVED IN THE PRESENCE

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OF BACKGROUND PLASMA, THEREBY CONFIRMING THE RETURN CURRENT THEORY. HOWEVER, SOME OF THE PHASE I RESULTS, SUCH AS THE OCCASIONAL PRODUCTION OF HIGH VOLTAGE PULSES WITHOUT CURRENT INTERRUPTION, COULD NOT BE EXPLAINED BY TRADITIONAL THEORIES. THE PHASE II PROGRAM WILL ATTEMPT TO EXPLAIN THESE PHENOMENA BY USING THE v(ph) x B ACCELERATION OR EXPLOSIVE RECONNECTION FLOW THEORIES RECENTLY FORMULATED TO EXPLAIN SOLAR FLARE AND FIELD REVERSAL CONFIGURATIONS. THE PRINCIPAL AIM OF THE PHASE II PROGRAM IS TO DEVELOP AN ADVANCED DPF ACCELERATOR. THE WORK WILL INCLUDE APPLICATIONS OF PREIONIZATION AND CROWBARRING TO THE MEBA, DETAILED EXAMINATION OF POST-FOCUS PHASE AND MODELING THIS PHASE WITH THE MAGNETIC COLLAPSE CONCEPT, BEAM PROPAGATION STUDY IN A MAGNETIZED PLASMA CHANNEL, ENHANCEMENT OF AVERAGE BEAM POWER EMPLOYING AN EXTERNALLY CONTROLLABLE, REPETITIVE ROTARY OPENING SWITCH, ADVANCED THOMSON PARABOLA INSTRUMENTATION, AMPLIFICATION OF BEAM ENERGY BY A MEBA ARRAY AND BY A MEBA AND LASER PBW ACCELERATOR COMBINATION.

AMERICAN RESEARCH CORP OF VA DARPA
PO BOX 3406 - 642 FIRST ST
RADFORD, VA 24143
CONTRACT NUMBER:
DR R J CHRUCHILL
TITLE:
MICROWAVE NDE SENSOR FOR IN-PROCESS CONTROL IN THE MANUFACTURE OF CARBON-CARBON COMPOSITES
TOPIC# 10 OFFICE: DARPA

CARBON-CARBON COMPOSITE MATERIALS ARE RECEIVING INCREASED ATTENTION FOR DEFENSE APPLICATIONS BECAUSE OF THEIR ATTRACTIVE PROPERTIES AT ELEVATED TEMPERATURES, HIGH STRENGTH, HIGH MODULUS, INERTNESS IN VACUUM, HIGH SPECIFIC CONDUCTIVITY, LOW DENSITY, LOW THERMAL EXPANSION AND LOW SUSCEPTABILITY TO RADIATION DAMAGE. AT PRESENT, FULL DEVELOPMENT OF THIS EMERGING TECHNOLOGY IS HAMPERED BY THE COMPLEXITY OF MANUFACTURING OPERATIONS AND THE LACK OF SENSORS WHICH COULD PROVIDE DETAILED INFORMATION ON COMPOSITE STATE DURING PROCESSING. THE PURPOSE OF THIS PROGRAM IS THE DESIGN AND DEVELOPMENT OF A NONDESTRUCTIVE EVALUATION (NDE) SYSTEM EMPLOYING CW MICROWAVE AND BROADBAND PULSED TECHNIQUES FOR CHARACTERIZING CARBON-CARBON COMPOSITE MATERIALS DURING PROCESSING. THE PHASE I PROGRAM DEMONSTRATED THE FEASIBILITY OF SUCH A SYSTEM BY EVALUATING THE ELECTROMAGNETIC PRO-

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PERTIES OF CARBON-CARBON COMPOSITE MATERIALS IN VARIOUS STAGES OF FABRICATION AND BY SHOWING THE USE OF RESONANT CAVITY AND COAXIAL MEASUREMENT TECHNIQUES TO IDENTIFY STAGES OF THE PROCESS. THE PHASE II PROGRAM WILL ACCOMPLISH THE TECHNICAL FEASIBILITY DEMONSTRATED IN PHASE I BY EXTENDING ELECTROMAGNETIC WAVE/MATERIALS INTERACTION THEORY TO ESTABLISH MODELS FOR EVALUATING THE EFFECTS OF CAVITY ENCLOSURES, SELECTING AND DESIGNING MICROWAVE AND BROADBAND PULSED INSTRUMENT SYSTEMS, DEVELOPING AND CALIBRATING HIGH TEMPERATURE PROBES, ACQUIRING FAMILIES OF TEST DATA IN LABORATORY AND INDUSTRIAL SETTINGS, DEVELOPING SIGNAL PROCESSING ALGORITHMS AND OPTIMIZING A PROOF-OF-CONCEPT SYSTEM. THIS PHASE II PROGRAM ADVANCES THE STATE-OF-THE-ART OF MONITORING CARBON-CARBON COMPOSITE MATERIALS FABRICATION BY USING EMBEDDED SENSORS TO DETECT PROPERTY CHANGES AT DEPTHS NOT PREVIOUSLY ACHIEVABLE. INSTRUMENTS WILL BE DESIGNED WHICH ARE CAPABLE OF SENSING THE RESPONSE OF CARBON-CARBON COMPOSITE MATERIALS UNDERGOING CARBONIZATION AND GRAPHITIZATION BY MEASURING THE MICROWAVE CAVITY CHARACTERISTICS OF INDUSTRIAL PROCESSING FURNACES DURING FABRICATION OPERATIONS.

ANADIGICS INC NAVY
35 TECHNOLOGY DR
WARREN, NJ 07060
CONTRACT NUMBER: N00039-88-C-0107
SARJIT S BHARJ
TITLE:
A CALIBRATED COST AND YIELD ANALYSIS MODEL FOR GALLIUM ARSENIDE MONOLITHIC MICROWAVE INTEGRATED CIRCUITS
TOPIC# 35 OFFICE: SPAWAR

TO OBTAIN AN ACCURATE COST AND YIELD FIGURES FOR A MONOLITHIC SUBSYSTEM IT BECOMES NECESSARY TO LINK THE DESIGN, PROCESSING AND FABRICATION, TESTING AND ASSEMBLY ACTIVITIES TO A COMMON MONITORING ACTIVITY. SUCH AN ACTIVITY WOULD DIRECT TOWARDS OBTAINING DATA FROM PROCESS, FABRICATION AND TESTING AND MAKE SUBSTANTIAL USE OF IN-PROCESS TESTING TO SCREEN OUT CIRCUITS AT AN EARLY STAGE. MMIC YIELD IS THE SIGNIFICANT FACTOR IN DETERMINING BOTH CHIP COST AND LEVEL OF INTEGRATION. IN ORDER TO MAXIMIZE YIELD IT IS NECESSARY TO ESTABLISH A CONSISTENT, REPRODUCIBLE PROCESS CONTROL, COUPLED WITH CREATIVE CIRCUIT DESIGN TECHNIQUES USED TO CREATE CHIP SETS WHICH ARE TOLERANT TO PROCESS VARIATION. A LARGE PROPORTION OF THE FINAL COST IS ALSO

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RELATED TO FINAL ASSEMBLY AND TESTING. THE PHASE II WORK WILL DEVELOP A CALIBRATED MODEL FOR COST AND YIELD ANALYSIS AND WILL INCORPORATE THE AVERAGE COMPONENT YIELD FACTORS FOR EACH ACTIVE AND PASSIVE ELEMENT, DETERMINED FROM THE PROCESS. IN ADDITION THE ANALYSIS, AS A SOFTWARE PACKAGE, WILL HAVE FLEXIBILITY SO AS TO LET ANY GALLIUM ARSENIDE FOUNDRY TO CALIBRATE IT TO THEIR PROCESS. THE FINAL SOFTWARE PACKAGE WILL BE MARKETED COMMERCIALLY IN PHASE III.

ANALYTICAL METHODS INC AF
2133 - 152ND AVE NE
REDMOND, WA 98052
CONTRACT NUMBER: F33615-87-C-3019
DR BRIAN MASKEW
TITLE:
A PREDICTION MODEL FOR ADVANCED LEADING-EDGE VORTEX FLOW CONTROL
TOPIC# 139 OFFICE: AFWAL/FI

THE PRIMARY OBJECTIVE OF THIS PROPOSAL IS THE FURTHER DEVELOPMENT OF UVSAERO, AN UNSTEADY (TIME-STEPPING) VERSION OF THE VSAERO PANEL CODE, TOWARDS TREATING THE VORTEX FLOWS ON ADVANCED FIGHTER AIRCRAFT. THE AIM IS TO DEVELOP THE CODE INTO A USABLE TOOL FOR TREATING VORTEX FLAPS AND OTHER DEVICES WHICH EXPLOIT VORTEX/SURFACE INTERACTIONS ON FIGHTER AIRCRAFT DURING HIGH-ALPHA MANEUVERS. THE PHASE I EFFORT DEMONSTRATED THE FEASIBILITY OF A SIMPLE MODEL TO REPRESENT THE EFFECTS OF A SECONDARY VORTEX; PART OF THE PROPOSED PHASE II EFFORT WOULD BE DIRECTED TOWARDS AUTOMATING THIS MODEL IN THE CODE. IN ADDITION, SEVERAL POSSIBLE REFINEMENTS WHICH WERE IDENTIFIED DURING THE PHASE I EFFORT, WOULD BE IMPLEMENTED WITH A VIEW TO IMPROVE EASE OF USE AND RELIABILITY OF THE CODE. ADDITIONAL CORRELATIONS WITH NEW VORTEX FLAP DATA WOULD BE PERFORMED AND PREDICTIONS FOR CORRELATION WITH FUTURE FORCED-ROLL OSCILLATION DATA WOULD BE CARRIED OUT USING THE UNSTEADY MOTION CAPABILITY OF THE CODE. THE PROPOSAL ALSO INCLUDES A TASK TO DEVELOP AN IRIS-COMPATIBLE WORKSTATION ENVIRONMENT FOR THE CODE WITH THE OBJECTIVE OF IMPROVING THE USABILITY OF THE TOOL AND TO ENHANCE THE ASSIMILATION OF THE LARGE VOLUME OF COMPUTED DATA. THIS TASK WOULD EXTEND THE CDMS CAPABILITY FOR GENERATING THE INPUT DATA FOR THE VSAERO CODE AND WOULD CONTROL JOB SUBMITTAL TO A MAINFRAME COMPUTER, PLOT FILE RETRIEVAL AND INTERACTIVE GRAPHICS DISPLAY OF THE GENERATED DATA.

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ANALYTICS INC — ARMY
2500 MARYLAND RD
WILLOW GROVE, PA 19090
CONTRACT NUMBER:
JAMES STOKES
TITLE:
ARTIFICIAL INTELLIGENCE JOB PERFORMANCE AID (AIJPA)
TOPIC# 118 OFFICE: TACOM/AMSTA

THE PRIMARY OBJECTIVE OF THE PHASE I EFFORT WAS TO ESTABLISH THE DESIGN FEASIBILITY OF A STAND-ALONE ARTIFICIAL INTELLIGENCE JOB PERFORMANCE AID (AIJPA) FOR THE ACCOMPLISHMENT OF INTERMEDIATE MAINTENANCE TASKS. WITH THESE ISSUES RESOLVED, THE PHASE II EFFORT WILL CONCERN ITSELF WITH THE DEVELOPMENT OF A LABORATORY ENVIRONMENT, THE CONSTRUCTION OF AN AIJPA PROTOTYPE, AND THE REFINEMENT OF THE SYSTEM. OUR APPROACH TO MEETING THIS INVOLVES BUILDING A LABORATORY FACILITY FOR AIJPA SYSTEM DEVELOPMENT; DEVELOPING AN EXPERT SYSTEM KNOWLEDGE BASE AND CAPTURING HMMWV AND CUCV DIAGNOSTIC EXPERTISE; DEVELOPING AN ADAPTABLE INTERFACE BASED ON HUMAN/MACHINE VOICE COMMUNICATION; AND TESTING IN THE CONTEXT OF ACTUAL PERSONNEL, VEHICLES, AND MAINTENANCE FACILITIES IN ORDER TO REFINE THE PROTOTYPE.

APA OPTICS INC — AF
2950 NE 84TH LANE
BLAINE, MN 55432
CONTRACT NUMBER: F33615-87-C-3618
DR ANIL K JAIN
TITLE:
HOLOGRAPHIC HEAD - UP - DISPLAY
TOPIC# 126 OFFICE: AFWAL/FI

THE OVERALL OBJECTIVE OF THE PHASE II PROGRAM WILL BE TO DESIGN AND BUILD A COMPLETE HOLOGRAPHIC HUD FOR F-16 C/D INCLUDING COMBINER AND RELAY OPTICS. HOLOGRAPHIC COMBINER WILL RESULT IN INCREASED FIELD OF VIEW AND IMPROVE EFFICIENCY. REPLACEMENT OF THE RELAY OPTICS WITH HOLOGRAPHIC LENSES WILL RESULT IN LOW WEIGHT AND LOW COST OPTICAL SYSTEM. IN PHASE I PROGRAM WE HAVE DEMONSTRATED THE FEASIBILITY OF TRANSMISSION HOLOGRAPHIC LENSES AS A REPLACEMENT FOR RELAY OPTICS.

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IN PHASE II WE WILL DESIGN THE ENTIRE DISPLAY AND HOLOGRAM FABRICATION OPTICS TO ACCOMPLISH OUR OBJECTIVES. THE KEY ISSUES TO BE ADDRESSED ARE THE DIFFRACTION EFFICIENCY, SPECTRAL SHIFT, ANGULAR BANDWIDTH AND "ZERO - ORDER" BLOCKING. WE WILL DESIGN AND BUILD COMPUTER GENERATED HOLOGRAMS (CGH) TO RECORD COMPLEX HOLOGRAMS FOR OPTIMUM PERFORMANCE. THE RESULT OF THE PROPOSED EFFORT WILL BE TO DEMONSTRATE THE ENTIRE HOLOGRAPHIC HUD, FOR FURTHER ENGINEERING DEVELOPMENT.

APPLICATIONS RESEARCH CORP SDIO
330 S LUDLOW ST
DAYTON, OH 45402
CONTRACT NUMBER:
THOMAS V BROWN
TITLE:
ADA ROBUST SOFTWARE RELIABILITY DEMONSTRATION
TOPIC# 9 OFFICE:

VERY LARGE BODIES OF COMPLETELY RELIABLE SOFTWARE WILL BE REQUIRED FOR EACH STRATEGIC DEFENSE SYSTEM COMPONENT, REGARDLESS OF WHICH MODES OF DEFENSE ARE ULTIMATELY SELECTED, SINCE THEY ALL DEPEND ON ABSOLUTE SOFTWARE RELIABILITY. CERTAIN FEATURES OF THE ADA PROGRAMMING LANGUAGE MAY HAVE THE CAPABILITY TO BE USED TO DETECT AND HANDLE HIDDEN SOFTWARE ERRORS WHICH WOULD OTHERWISE HALT PROGRAM EXECUTION. UNDER A PREVIOUS RESEARCH PHASE, AN ADA SOFTWARE DRIVER OR SIMULATOR WAS DEVELOPED THAT IS ABLE TO RUN ADA SOFTWARE COMPONENTS UNDER A VARIETY OF TIME AND LOAD CONDITIONS AND THAT HAS BEEN SUCCESSFULLY APPLIED TO DISCRETE EVENT-DRIVEN SIMULATIONS. UNDER THE CURRENT RESEARCH EFFORT, ROBUST SOFTWARE GUIDELINES ARE BEING CREATED THAT CAN BE USED BY BATTLE MANAGEMENT SOFTWARE DESIGNERS AND PROGRAMMERS TO DETECT ERRORS IN MISSION CRITICAL SOFTWARE. THESE GUIDELINES ARE BEING DEMONSTRATED BY WRITING ADDITIONAL CODE INTO AN EXISTING COMPLEX ADA PROGRAM, WITH AN INDEPENDENT GROUP OF PROGRAMMERS ATTEMPTING TO INSERT SUBTLE ERRORS WHICH COULD CAUSE FAILURE.

APPLICATIONS RESEARCH CORP AF
2 DAVID ST - STE F
FT WALTON BEACH, FL 32548
CONTRACT NUMBER: 87-25086
CLIFFORD H ALLEN JR
TITLE:
WEAPON SYSTEM PERFORMANCE MEASUREMENT TECHNIQUES (WSPMT)
TOPIC# 19 OFFICE: AFATL/ASI

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THIS RESEARCH WILL DEMONSTRATE FEASIBILITY AND PROVIDE TECHNOLOGICAL INNOVATIVE SOLUTIONS TO SOME OF THE ENGINEERING PROBLEMS ASSOCIATED WITH AN ONBOARD AIRCRAFT EMBEDDED WEAPON EVALUATION SYSTEM. A MODULAR/REAL TIME MUNITION FLYOUT SIMULATION MODEL WILL BE DEMONSTRATED. AIRCRAFT TESTBED OPTIONS WILL BE EVALUATED. ALTERNATIVES TO PROVIDING REALISTIC TARGET PARAMETERS DATA TO THE AIRBORNE SIMULATION WILL BE EVALUATED. INSTRUMENTATION TECHNOLOGIES TO SUPPORT THE WSPMT CONCEPT WILL BE DETERMINED. DATA ACQUISITION, PROCESSING, STORAGE AND RETRIEVAL REQUIREMENTS WILL BE DETERMINED AND A DATA HANDLING PLAN DEVELOPED. THE REQUIREMENTS FOR A SUPPORTING GROUND BASED SYSTEM WILL BE DEFINED. INVESTIGATIONS WILL BE MADE INTO THE APPLICATION OF AI TECHNIQUES AND METHODS TO ENHANCE CAPABILITIES OF THE SYSTEM. THE EXTENSIONS OF THE SYSTEM CAPABILITIES TO PROVIDE MAN-IN-THE-LOOP TRAINING WILL BE INVESTIGATED.

APPLIED LOGIC SYSTEMS INC ARMY
PO BOX 90 - UNIVERSITY STATION
SYRACUSE, NY 13210
CONTRACT NUMBER:
KENNETH A BOWEN
TITLE:
PC EXPERT SYSTEMS/DBMS INTERFACE TOOLS
TOPIC# 54 OFFICE: CECOM/AMSEL

PHASE I OF THIS EFFORT SUCCESSFULLY DEVELOPED TOOLS FOR BUILDING EFFICIENT AND DIRECT INTERFACES BETWEEN PROLOG AND dBASEIII DATABASES ON THE PC. THE EFFECT OF THESE INTERFACES IS TO ALLOW THE dBASEIII DATABASES TO DEFINE VIRTUAL PROLOG PREDICATES CONSISTING ENTIRELY OF FACTS WHICH CORRESPOND TO THE TUPLES IN THE TABLES OF THE dBASEIII DATABASE. THESE INTERFACES ALLOW EXPERT SYSTEMS BUILT IN PROLOG TO BE DIRECTLY COUPLED WITH DATABASES MAINTAINED BY dBASEIII. THE GOALS OF PHASE II OF THIS EFFORT IS TO SUBSTANTIALLY EXTEND THE TECHNOLOGY DEVELOPED IN PHASE I TO PROVIDE A SOUND TECHNOLOGICAL BASE SUPPORTING THE CONSTRUCTION OF COMPLEX INTELLIGENT DISTRIBUTED INFORMATION MANAGEMENT SYSTEMS. THE INTENDED AREAS OF APPLICATION OF THESE DISTRIBUTED INFORMATION MANAGEMENT SYSTEMS RANGE FROM MILITARY INTELLIGENCE TO LARGE-SCALE COMPUTER-AIDED DESIGN EFFORTS. THE WORK PRODUCTS OF THIS EFFORT WILL BE A COLLECTION OF HIGH-LEVEL INTERRELATED TOOLS FOR INTELLIGENT SYSTEM CONSTRUCTION AND INTEGRATION.

APPLIED ORDNANCE TECHNOLOGY INC NAVY
9015 WOODYARD RD - STE 108
CLINTON, MD 20735
CONTRACT NUMBER:
RAYMOND L BEAUREGARD
TITLE:
INSENSITIVE MUNITIONS SLOW COOKOFF PROTECTION CONCEPTS
TOPIC# 62 OFFICE: NAVSEA

1

SUBMITTED BY DEPT

NAVY TECHNICAL REQUIREMENTS FOR INSENSITIVE MUNITIONS, NAVSEAINST 8020.5, STATES THAT "BURNING" IS THE ONLY ACCEPTABLE REACTION TO THE MIL-STD-2105 SLOW COOK-OFF TEST. TYPICAL REACTIONS IN THIS TEST ARE DETONATIONS OR PARTIAL DETONATIONS. ENERGETIC MATERIALS EXPOSED TO ELEVATED TEMPERATURES, UNDERGO A SLOW CHEMICAL REACTION, FINALLY REACHING A POINT OF AUTOCATALYTIC DECOMPOSITION, RESULTING IN VERY VIOLENT REACTIONS. PHASE I OF THIS PROGRAM WAS TO COLLECT AND CATALOGUE DATA ON THERMAL PROPERTIES AND COOK-OFF REACTIONS FOR ENERGETIC MATERIALS AND DEVELOP A PRELIMINARY MATHEMATICAL MODEL TO PREDICT THE RELATIONSHIP BETWEEN EXPLOSIVE VIOLENCE, AND THERMAL INPUT, MATERIAL CHARACTERISTICS AND CONFINEMENT. PHASE II IS TO PERFORM TESTS, TO ACQUIRE DATA NOT NOW AVAILABLE BUT NECESSARY FOR THE MODEL, FURTHER DEVELOP THE MODEL, PREDICT REACTIONS FOR REAL MUNITIONS, AND TEST TO VALIDATE THE PREDICTED VIOLENCE OF THE THERMAL REACTIONS.

APPLIED RESEARCH INC NAVY
PO BOX 11220 - 5025 BRADFORD BLVD
HUNTSVILLE, AL 35814
CONTRACT NUMBER:
LARRY Z KENNEDY
TITLE:
PROGRAMMABLE VIDEO RATE CORRELATOR
TOPIC# 174 OFFICE: JCM/NSWC

PROPOSED IS AN OPTICAL CORRELATOR OR CONVOLVER CAPABLE OF ACCEPTING RASTER SCANNED IMAGERY AT VIDEO RATES, AND CORRELATING WITH A LARGE LIBRARY OF REFERENCE IMAGES. THE BASIC EFFORT IS TO DEVELOP A BREADBOARD (DEMONSTRATION) MODEL OF AN ELECTRO-OPTIC CORRELATOR WHILE THE OPTION EFFORT IS TO CONSTRUCT THE BRASSBOARD MODEL.

APPLIED TECHNOLOGY ASSOCS INC AF
PO BOX 9154
ALBUQUERQUE, NM 87119
CONTRACT NUMBER: F29601-87-C-
DR A ERTEZA
TITLE:
OPTIMUM PUPIL FUNCTIONS
TOPIC# 83 OFFICE: AFWL/PRC

SUBMITTED BY DEPT

THE FORMALISM DEVELOPED IN PHASE I WILL BE APPLIED TO A VARIETY OF IMAGING SYSTEMS, ALLOWING TRADE-OFF ANALYSES BETWEEN COMPETING PUPIL DESIGN APPROACHES. THE TECHNIQUE WILL BE EXTENDED TO INCORPORATE A BROAD RANGE OF QUADRATIC FUNCTION, OPTIMIZATION CRITERIA. THE TECHNIQUE WHICH ALLOWS SYNTHESIS OF OPTIMUM PUPIL FUNCTIONS WILL BE WILL BE INCORPORATED INTO A SYSTEMS ANALYSIS TOOL CAPABLE OF END-TO-END SYSTEM SIMULATION. APPLICATIONS WILL INCLUDE BOTH SPARSE AND SEGMENTED APERTURES WITH BOTH CONCENTRATED ENERGY AND IMAGE FIDELITY MAXIMINATION CRITERIA. SOURCE ILLUMINATION WILL INCLUDE INCOHERENT AND LASER ILLUMINATED CASES. THE EFFECTS OF PISTON, TILT, AND HIGHER ORDER ABERRATIONS WILL BE INCORPORATED IN THE TRADE-OFF ANALYSES. OPTIMUM PUPIL FUNCTIONS WILL BE DESIGNED AND EXPERIMENTAL VERIFICATION TECHNIQUES WILL BE ESTABLISHED.

APTEK INC AF
2862 S CIRCLE DR - STE 346
COLORADO SPRINGS, CO 80906
CONTRACT NUMBER: F08635-87-C-0442
MARK D LANDON
TITLE:
AN INTERACTIVE OPTIMIZATION-BASED COMPUTER GRAPHICS SOFTWARE PACKAGE
TOPIC# 32 OFFICE: AD/XRCD

THE OVERALL GOAL OF THIS WORK IS TO DEVELOP AN INTERACTIVE, OPTIMIZATION BASED, GRAPHICAL SOFTWARE PACKAGE TO HELP THE USER TO TAKE A WEAPON FROM CONCEPT TO TEST SPECIMENT QUICKLY AND ACCURATELY. THE USER WILL BE ABLE TO: 1) CREATE ARBITRARY SHAPED GEOMETRY MODELS OF AIRCRAFT AND WEAPONS, 2) RECALL ANY GEOMETRIC MODEL IN THE DATA BASE, 3) STUDY COMPATIBILITY OF THE PHYSICAL FIT OF STORES ON AIRCRAFT, 4) OPTIMALLY PACKAGE SUBMUNITIONS IN A MISSILES, 5) GENERATE FINITE ELEMENTS MODELS, 6) CREATE DATA FILES OF OUTPUT FUNCTION DATA FROM PREDICTION CODES, 7) GENERATE COMPUTER COLOR GRAPHICS DISPLAY OF ALL OF THE ABOVE, AND 8) WRITE INSTRUCTIONS FOR COMPUTER CONTROLLED MILLING MACHINES TO MAKE TEST SPECIMENS OF THE GEOMETRIC MODELS.

ARBUS INC NAVY
PO BOX 80388 - 4420 ARVILLE/STE 8
LAS VEGAS, NV 89180
CONTRACT NUMBER:
NORM H DYE
TITLE:
FUZE CONTACT SENSING TRANSDUCER
TOPIC# 134 OFFICE: NWC/NAVSEA

SUBMITTED BY DEPT

THIS PROPOSAL DESCRIBES THE PHASE II DEVELOPMENT WORK FOR AN ADVANCED "FAIL-SAFE" FIBER OPTIC FUZE CONTACT TRANSDUCER FOR USE IN AIRBORNE MISSILE APPLICATIONS. THE SENSOR WOULD EXPLOIT A RECENT TECHNOLOGICAL DEVELOPMENT: THE SENSITIVITY OF SPECIALIZED OPTICAL FIBERS TO MICROBENDING. THIS PHENOMENON WOULD BE USED TO DETECT PLASTIC DEFORMATION OF A MISSILE SKIN AND/OR STRUCTURAL COMPONENTS. THE OBJECTIVES OF THE PHASE II EFFORT INCLUDE: DEVELOPMENT OF A PROTOTYPE ACTIVE FIBER SECTION. DEVELOPMENT OF FIBER TO COMPONENT ATTACHMENT METHODS. ELECTRO-OPTICAL INTERFACE DEVELOPMENT. ENVIRONMENTAL AND FEASIBILITY TESTING OF A COMPLETE PROTOTYPE FIBER OPTIC BASED FUZE CONTACT SENSOR TO MEET MISSILE HANDLING, FLIGHT, AND SAFETY REQUIREMENTS.

ARIAS RESEARCH ASSOCS INC AF
9241 CORD AVE
DOWNEY, CA 90240
CONTRACT NUMBER:
JEFFREY L ARIAS
TITLE:
ELECTRICALLY-ACTIVATED AQUEOUS-ELECTROLYTE RESERVE BATTERY
TOPIC# 262 OFFICE: BMO/MYSC

THE FULL DEVELOPMENT OF A COMPACT ACQUEOUS-ELECTROLYTE RESERVE BATTERY IS PROPOSED. ELECTRICAL ACTIVATION IS ACCOMPLISHED BY INITIATING A GAS GENERATOR CARTRIDGE TRANSFER TO THE ELECTROLYTE FROM A HERMETICALLY SEALED RESERVOIR TO THE CELLS. HIGH VOLUMETIC POWER DENSITY IS ACHIEVED USING THIN SPIRAL WRAPPED PLATES. BATTERY OPERATION SIGNIFICANTLY BELOW 0 DEG F IS PREDICTED.

ARKADY ASSOCS ARMY
PO BOX 1960
GARDEN GROVE, CA 92642
CONTRACT NUMBER:
ELMER J DRYER
TITLE:
AN INNOVATIVE KNOWLEDGE BASE EW POWER MANAGEMENT SYSTEM
TOPIC# 61 OFFICE: CECOM/AMSEL

SOVIET DESIGNERS HAVE DEVELOPED A NEW CLASS OF DIGITALLY CONTROLLED

SUBMITTED BY DEPT

PHASED ARRAY RADARS. WITH THE INTRODUCTION OF THESE NEW MULTI-MODE RADARS, US AIRCRAFT NOW FACE A FORMIDABLE ADDITION TO THE THREAT ENVIRONMENT. HOSTILE MULTI-MODE PHASED ARRAY RADARS MAY CONSTITUTE A SIGNIFICANT PORTION OF THE NEW ELECTRONIC ENVIRONMENT THAT US FORCES CAN EXPECT TO ENCOUNTER IN FUTURE ENGAGEMENTS. BECAUSE PHASED ARRAY RADARS ARE PROGRAMMED TO STEP FROM MODE TO MODE, A SET OF EW SIGNATURES WHICH ARE GENERIC TO EACH MODE OF OPERATION HAS BEEN DEFINED. THE SPEED AT WHICH COMPUTER CONTROLLED RADAR FUNCTIONS ARE PERFORMED WILL IMPACE THE SPEED OF RESPONSE REQUIREMENTS FOR FUTURE ELECTRONIC COUNTERMEASURE SYSTEMS. SINCE THE NEW MULTI-MODE PHASED ARRAY RADARS ARE COMPUTER CONTROLLED, THEY CAN UTILIZE OPTIMAL WAVE-FORMS FOR EACH OF THE RADAR'S MODE OF OPERATION BY THE PROPER CHOICE OF SIGNAL PARAMETERS. THESE PARAMETERS-AGILE RADARS PRESENT NEW CHALLENGES FOR SIGNAL SORTING AND PULSE TRAIN IDENTIFICATION. IT SHOULD BE POINTED OUT THAT THESE RADARS HAVE RIGID REQUIREMENTS FOR SIGNAL PARAMETERS IN EACH MODE OF OPERATION, AND ARE NOT TRULY PARAMETER AGILE AS AS ECCM FEATURE. PRESENT EW MANAGEMENT SYSTEMS UTILIZE FIXED SIGNAL PARAMETERS AND ARE GOAL-DRIVEN TO IDENTIFY AND TRACK SPECIFIC, WELL-KNOWN HOSTILE THREATS. FROM PRELIMINARY TESTS, THE PROPOSED KNOWLEDGE-DRIVEN SYSTEM APPEARS TO BE CAPABLE OF SOLVING THE RADAR MODE IDENTIFICATION PROBLEM. IF IMPLEMENTED, THIS CONCEPT WILL PLACE NEW REQUIREMENTS ON THE RECEIVING SUBSYSTEM AND ON ITS PULSE OR PULSE-TRAIN DESCRIPTOR WORK OUTPUTS. THESE RECEIVERS WILL BE REQUIRED TO BE RESPONSIVE TO COMMANDS FROM THE KNOWLEDGE-DRIVEN SYSTEM TO PERFORM SPECIAL SIGNAL SEARCHES, AND TO MAKE ADDITIONAL MEASUREMENTS AIMED AT INCREASING THE CONFIDENCE LEVEL OF CRITICAL DECISIONS MADE BY THE SYSTEM. IN ADDITION, PULSE TRAINS WILL NEED TO BE DEINTERLEAVED USING ANGLE OF ARRIVAL, AMPLITUDE AND FREQUENCY DATA ON INDIVIDUAL PULSES IN ORDER TO LINK FRAGMENTED SIGNAL MEASUREMENTS SO THAT DECISIONS CAN BE MADE AS SWIFTLY AND ACCURATELY AS POSSIBLE.

ASSOCIATES & FERREN NAVY
PO BOX 609 - WAINSCOTT NW RD
WAINSCOTT, NY 11975
CONTRACT NUMBER:
CHARLES HARRISON
TITLE:
REAL TIME 3-D COMPUTER VISION SYSTEM - IMPROVEMENTS THERETO THROUGH OPTICAL AND ELECTRONIC MEANS
TOPIC# 119 OFFICE: NSWC/SSPO

SUBMITTED BY DEPT

THE PURPOSE OF THIS PHASE II PROPOSAL IS TO DEVELOP A PROTOTYPE REAL TIME 3-D VISION SYSTEM CAPABLE OF GIVING RANGE, AZIMUTH, AND TARGET IDENTIFICATION WHEN COUPLED WITH AN OPTICAL CORRELATOR OR OTHER HIGH SPEED TARGET IDENFIFICATION SYSTEM. THIS SYSTEM IS BASED AROUND ASSOCIATES & FERREN'S PROPRIETARY 3D VISION SYSTEM COUPLED WITH LASER BASED OPTICAL CORRELATION EQUIPMENT TESTED UNDER THE ABOVE REFERENCED PHASE I SBIR. THESE COMBINED SYSTEMS SHOW THAT ACTUAL REAL TIME TARGET IDENTIFICATION THROUGH OPTICAL CORRELATION WITH ACCURATE RANGING AND AZIMUTH INFORMATION IS POSSIBLE IN NATURAL, REAL WORLD ENVIRONMENTS. BASED ON EXPERIMENTS CONDUCTED DURING PHASE I, WE PLAN TO FURTHER DEVELOP THE OPTICAL PROCESSOR TEST BED AND BUILD AN UPDATED 3-D VISION CAMERA WITH INCREASED PORTABILITY THAT CAN BE USED IN ACTUAL FIELD ENVIRONMENTS.

ASTRO INNOVATIONS INC SDIO
290 PHEASANT RUN
FEASTERVILLE, PA 19047
CONTRACT NUMBER:
JOSEPH BEDNARZ
TITLE:
LIQUID EXOATMOSPHERIC COUNTERMEASURES
TOPIC# 2 OFFICE:

THE FEASIBILITY HAS BEEN DEMONSTRATED FOR UTILIZING STREAMS OF LIQUID DROPLETS RELEASED INTO SPACE AS A MEANS OF DEFEATING KINETIC ENERGY WEAPON (KEW) PROJECTILES WHICH ARE ATTACKING POST BOOST VEHICLES (PBVs) AND THEIR DEPLOYED PAYLOADS. TECHNIQUES ARE BEING DEVELOPED FOR THE CONTROL OF DROPLET STREAMS IN SUPPORT OF THE SPACE DROPLET RADIATOR. THESE TECHNIQUES ARE EXPECTED TO FORM THE BASIS BY WHICH DROPLETS OF ONE TO TWO ORDERS OF MAGNITUDE LARGER DIAMETER CAN BE FORMED AND ACCURATELY RELEASED TO SHIELD PVBs, REENTRY VEHICLES (RVs), AND DECOYS FROM KEW ATTACK. WORK PLAN ACTIVITIES ARE BEING UNDERTAKEN THAT ARE DESIGNED TO FURTHER THE DEVELOPMENT OF THE LIQUID ANTI-KEW EXOATMOSPHERIC COUNTERMEASURE. IN ADDITION, RELATED WORK IS BEING PERFORMED TO INVESTIGATE THE POTENTIAL FOR FACILITATING THE UNDISCRIMINATED DEPLOYMENT AND ERECTION OF REPLICA DECOYS AND FOR EMPLOYING THE SAME LIQUID DROPLET TECHNIQUE TO PROVIDE UNAMBIGUOUS DETECTION OF RVs DURING MIDCOURSE. IN ADDITION TO STRATEGIC DEFENSE USES, POTENTIAL COMMERCIAL APPLICATIONS FOR CONTROLLED LIQUID STREAMS IN SPACE INCLUDE SLURRY-BASED TRANSPORTATION, AEROBRAKING FOR ORBITAL

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TRANSFER VEHICLES, SCAVENGING PLANETARY GASES, AND DETUMBLING OF ERRANT SPACECRAFT.

ASTRON CORP NAVY
929 W BROAD ST - STE 249
FALLS CHURCH, VA 22046
CONTRACT NUMBER: N00039-88-C-0119
JOSEPH R JAHODA
TITLE:
LIGHTWEIGHT BROADBAND SHIPBOARD HIGH FREQUENCY ANTENNA
TOPIC# 34 OFFICE: SPAWAR

A SERIES OF BROADBAND HF ANTENNA STRUCTURES WAS ANALYZED FOR POTENTIAL SHIPBOARD APPLICATIONS. INCLUDED WERE ALTSHULTER INSERTIONS, DIELECTRIC LOADING, MULTIPLE REACTIVE INSERTIONS, ACTIVE TRANSMIT ANTENNA, AND MULTIPLE TRANSMISSION LINES. OBJECTIVES INCLUDE 3 TO 1 MAXIMUM VSWR OVER THE 2 TO 30 MHz BAND, OMNI-DIRECTIONAL, MEET SEVERE ENVIRONMENTAL SPECIFICATIONS, HIGH EFFICIENCY, AND OPERATE WITH 1 KILOWATT RF INPUT. THE COMPUTER ANALYSIS AND LABORATORY DATA CONFIRMED THE FEASIBILITY OF THE DEVELOPMENT OF AN ANTENNA WHICH WOULD COMBINE THE BROADBANDING TECHNIQUES INVESTIGATED AND ACHIEVE THE DESIRED OBJECTIVES. A SIMILAR ANALYSES WAS MADE FOR A BROADBAND RECEIVING ANTENNA. SEVERAL ACTIVE DESIGNS WERE CONSIDERED INCLUDING SOLID STATE AND VACUUM TUBE VERSIONS.

ASTRON RESEARCH & ENGINEERING SDIO
130 KIFER CT
SUNNYVALE, CA 94086
CONTRACT NUMBER:
CHARLES POWARS
TITLE:
HIGH PERFORMANCE ELECTROMAGNETIC RAIL GUN INSULATORS
TOPIC# 2 OFFICE:

RAIL INSULATOR MATERIALS PERFORMANCE IS CRITICAL TO THE VIABILITY ELETROMAGNETIC RAILGUNS AS PRACTICAL WEAPONS. THE INSULATORS ARE EXPOSED TO A SEVERE THERMAL, MECHANICAL, AND ELECTRICAL MULTI-SHOT ENVIRONMENT. RAIL INSULATOR MATERIALS ARE BEING IDENTIFIED AND DEMONSTRATED THAT REMAIN DIELECTRIC IN THIS ENVIRONMENT WITHOUT

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SIGNIFICANT ABLATION, DEFORMATION, FRACTURE OR OTHER DEGRADATION. PREVIOUS SINGLE-SHOT RAILGUN TESTS SUCCESSFULLY DEMONSTRATED IMPROVED INSULATOR PERFORMANCE RELATIVE TO CURRENT USED MATERIALS. HOT-PRESSED SILICON NITRIDE INSULATORS DID NOT FRACTURE, HAD NEGLIGIBLE ABLATION AND DEVELOPED A PARTIALLY CONDUCTIVITY COATING. IN THE CURRENT EFFORT, ANALYSIS AND TESTING ARE BEING UNDERTAKEN OF SILICON NITRIDES, OTHER PROMISING CERAMICS, AND HIGH TEMPERATURE REINFORCED POLYMERS. PROCEDURES FOR FABRICATING LARGE INSULATORS FROM OPTIMUM MATERIALS ARE BEING ESTABLISHED. AT LEAST ONE SET OF HIGH PERFORMANCE INSULATORS ARE BEING FABRICATED, FOR RETROFIT AND DEMONSTRATION IN A LARGE-SCALE RAILGUN. THIS RESEARCH, WHEN SUCCESSFUL, WILL IDENTIFY AN INSULATOR MATERIAL WHICH ENABLES ELECTROMAGNETIC RAILGUNS TO REALIZE THEIR PERFORMANCE POTENTIAL. IT IS ANTICIPATED THAT THE INSULATORS WILL BE MANUFACTURABLE IN LENGTHS ADEQUATE FOR FULL-SCALE RAILGUN WEAPONS, AND WILL BE COMPATIBLE WITH OTHER BARREL COMPONENTS.

ASTROSYSTEMS INC (ASTROPOWER DIV) DARPA
30 LOVETT AVE
NEWARK, DE 19711
CONTRACT NUMBER:
JAMES B McNEELY
TITLE:
HIGH-SPEED LOW-COST OPTICAL INTERCONNECT
TOPIC# 13 OFFICE: DARPA

IN THE PHASE I PROGRAM, THE GROWTH OF LIGHT-EMITTING ELEMENTS WAS DEMONSTRATED ON SELECTED AREAS OF SILICON VLSI WAFERS USING SELECTIVE LIQUID PHASE EPITAXIAL GROWTH METHODS DEVELOPED AT ASTROPOWER. THIS PHASE II PROPOSAL DESCRIBES A RESEARCH PLAN TO DEMONSTRATE SIMPLE, MANUFACTURABLE, INTEGRATED, MONOLITHIC, OPTICAL INTERCONNECTS BASED ON GALLIUM ARSENIDE HETEROEPITAXIAL LED STRUCTURES ON VLSI NMOS OR BIPOLAR TRANSMITTER AND BIPOLAR RECEIVER CIRCUITS. FREE SPACE OPTICS WILL BE INVESTIGATED AND COMPARED TO THE RESULTS OF GUIDED WAVE OPTICS. RESULTS OF THIS WORK WILL LEAD TO AN OPTIMIZED EMITTER-DETECTOR PAIR.

ASTROSYSTEMS INC (ASTROPOWER DIV) AF
30 LOVETTE AVE
NEWARK, DE 19711
CONTRACT NUMBER: F33615-87-C-2814
J S CULIK
TITLE:
HIGH-EFFICIENCY THIN-FILM SILICON SOLAR CELL FOR IMPROVED RADIATION RESISTANCE
TOPIC# 180 OFFICE: AFWAL/PO

SUBMITTED BY DEPT

DEGRADATION IN SILICON SOLAR CELL PERFORMANCE UNDER IRRADIATION IS PRINCIPALLY DUE TO A REDUCTION IN THE MINORITY-CARRIER LIFETIME THAT RESULTS FROM RADIATION DAMAGE TO THE CRYSTAL LATTICE. DURING THE PHASE I EFFORT WE DEMONSTRATED THE TECHNICAL FEASIBILITY OF A NEW CLASS OF SILICON SOLAR CELL DESIGNS THAT UTILIZE A THIN-BASE, LIGHT-TRAPPING STRUCTURE. THIS NEW DESIGN EFFECTIVELY REDUCES THE REQUIREMENT FOR LONG MINORITY-CARRIER LIFETIME, AND THEREFORE LEADS TO AN IMPORTANT OPPORTUNITY FOR SIGNIFICANTLY INCREASING THE RADIATION RESISTANCE, AND THEREFORE EXTENDING THE USEFUL LIFE, OF SILICON SOLAR CELLS DEPLOYED IN SPACE. THIS HIGH EFFICIENCY DESIGN CONSISTS OF A THIN FILM OF ELECTRICALLY-ACTIVE SILICON GROWN IN A LIGHT-TRAPPING CONFIGURATION ON AN OXIDE-COATED SUPPORTING SUBSTRATE. THE OXIDE LAYER PASSIVATES THE BACK SURFACE OF THE FILM AND ALSO ACTS AS A BURIED DIELECTRIC BACK SURFACE REFLECTOR LEADING TO LIGHT-TRAPPING IN THE SEMICONDUCTOR GROWTH TECHNIQUE CAPABLE OF RAPIDLY PRODUCING LARGE-AREA, PHOTOVOLTAIC QUALITY FILMS USING SIMPLE AND INEXPENSIVE EQUIPMENT. DEVELOPMENT OF THIS NOVEL, THIN-FILM, CRYSTALLINE SILICON SOLAR CELL WILL RESULT IN A NEW CLASS OF SOLAR CELL DESIGNS THAT COMBINE HIGH SPECIFIC POWER, EASE OF MANUFACTURE AND HANDLING, RADIATION RESISTANCE, AND LONG LIFE.

ATLANTIC AEROSPACE (OLD: POLLARD RD INC) ARMY
2361 JEFFERSON DAVIS HWY - STE 708
ARLINGTON, VA 22202
CONTRACT NUMBER:
DR ALFRED REICH
TITLE:
MILLIMETER WAVE INSTRUMENTATION RADAR
TOPIC# 169 OFFICE: TECOM/WSMR

A PRECISION RADAR IS REQUIRED TO COMPLEMENT OPTICS INSTRUMENTATION FOR TRACKING AND DIAGNOSTIC TESTING OF THE MULTIPLE LAUNCH ROCKET SYSTEM (MLRS) AND SIMILAR SYSTEMS FOR MEASUREMENT OF RANGE FOR HAND-OVER; TARGET SELECTION BASED ON RANGE AND DOPPLER; EXTENSIVE DIAGNOSTIC DATA ON THE SUBMUNITIONS. DURING PHASE I, VARIOUS FORMS OF MMW RADAR WERE EXAMINED IN TRADEOFF AND TECHNOLOGY MATURITY STUDIES TO DEFINE THE BEST DESIGN. THE EMPHASIS WAS ON AUTONOMOUS TARGET SELECTION; THIS WAS THE MAJOR UNSOLVED PROBLEM AND REQUIRED INNOVATION AND TECHNOLOGY FOR SOLUTION. THE RESULTING 35, GHz RADAR IS FEASIBLE BUT REQUIRES DEVELOPMENT. PRINCIPAL TECHNICAL CHALLENGES

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ARE: (1) DEVELOPMENT OF THE RF SYSTEM (EXCITER, TRANSMITTER, LOW-NOISE RECEIVER) FOR COHERENT, HIGH PRF OPERTATION AND (2) DEVELOPMENT OF AUTOMATED TARGET SELECTION ALGORITHMS. THIS PHASE II EFFORT ADDRESSES THESE SPECIFIC DEVELOPMENT AREAS WHICH PROVIDING A SUITABLE RADAR FOR RANGE MEASUREMENTS. ELEMENTS OF THE COMPLETE RADAR TO DEVELOP AND PROVE THE RF SYSTEM WILL BE BUILT AND INTEGRATED INTO AN OPERATIONAL RADAR FOR MEASURMENET OF RANGE IN CONJUNCTION WITH THE OPTICS. TARGET SELECTION ALGORITHMS WILL BE ANALYTICALLY DEMONSTRATED. ADDITIONAL SUBSYSTEMS CAN THEN BE COMPARED ON PHASE III FUNDING TO GET FULL CAPABILITY.

ATLANTIC AEROSPACE ELECTRONIC/POLLARD RD AF
470 TOTTEN POND RD
WALTHAM, MA 02154
CONTRACT NUMBER:
DR JAMES R ROGERS
TITLE:
CONICAL VEHICLE ANTENNA ANALYSIS
TOPIC# 259 OFFICE: BMO/MYSC

THIS WORK INVOLVES A COMPREHENSIVE ANALYSIS AND DESIGN STUDY INTO ADVANCED ANTENNAS AS APPLIED TO REENTRY VEHICLE AND MISSILE APPLICATIONS. A STATE-OF-THE-ART ANALYSIS WILL BE DEVELOPED WHICH ACCURATELY MODELS THE EXCITATION OF THE ANTENNA AND ITS RADIATIVE PROPERTIES, ACCOUNTS FOR THE DIELECTRIC ENVIRONMENT THAT THE ANTENNA IS SITUATED IN, AND PREDICTS THE VEHICLE AND ANTENNA SIGNATURE AT FREQUENCIES COMPARABLE TO THE RADIATING FREQUENCY. THE FOUNDATION OF THE ANALYSIS WILL BE A WELL-DOCUMENTED, USER-FRIENDLY, METHOD-OF-MOMENTS COMPUTER CODE WHICH WILL BE DEVELOPED BACED UPON THE INNOVATIONS TESTED IN THE PREVIOUS SBIR PHASE I WORK. THE CODE WILL BE VALIDATED USING BOTH NUMERICAL STUDIES AND ACTUAL MEASUREMENTS. THE ANALYSIS WILL BE APPLIED TO OPTIMIZE ANNULAR-SLOT-ANTENNA DESIGNS FOR CURRENT MISSILE APPLICATIONS.

ATLANTIC EROSPACE ELECTRONIC(POLLARD RD) AF
470 TOTTEN POND RD
WALTHAM, MA 02154
CONTRACT NUMBER:
THEODORE BIALLY
TITLE:
MORPHOLOGICAL TARGET DETECTION AND ANALYSIS
TOPIC# 225 OFFICE: BMO/MYSC

SUBMITTED BY DEPT

THIS WORK INVOLVES THE COMPREHENSIVE EVALUATION OF THE APPLICATION OF MORPHOLOGICAL SIGNAL PROCESSING CONCEPTS TO THE PROBLEM OF DETECTING AND ANALYZING SRT-LIKE OBJECTS IN DENSE CLUTTER ENVIRONMENTS. THE IMPROVEMENT OF FALSE ALARM REDUCTION USING MORPHOLOGICAL FILTERS FOR TARGET DETECTION WAS DEMONSTRATED UNDER THE PREVIOUS PHASE I EFFORT. THIS WORK EXTENDS THOSE RESULTS TO REALISTIC TREE-LINE SCENARIOS AND, MORE IMPORTANTLY, BEGINS NEW WORK IN THE AREA OF MORPHOLOGICAL SIGNAL PROCESSING FOR SRT FEATURE EXTRACTION. THE SIGNIFICANCE OF USING MORPHOLOGICAL SIGNAL PROCESSING FOR BOTH DETECTION AND ANALYSIS IS THAT THESE POWERFUL TECHNIQUES PERMIT THE INCORPORATION OF IMAGE STRUCTURAL INFORMATION AT AN EARLY POINT IN THE SIGNAL PROCESSING CHAIN AND CAN LEAD TO SIGNIFICANT PERFORMANCE IMPROVEMENTS AT RELATIVELY LOW COMPUTATIONAL COST. THE FINAL PART OF THIS EFFORT INVOLVES THE DESIGN OF A CUSTOM INTEGRATED CIRCUIT CHIP FOR DEMONSTRATING THE ULTIMATE CAPABILITY OF PUTTING A TARGET DETECTION AND ANALYSIS SYSTEM BASED ON MORPHOLOGICAL SIGNAL PROCESSING IN A SMALL LOW POWER PACKAGE.

ATMOSPHERIC & ENVIRONMENTAL RESEARCH INC AF
840 MEMORIAL DR
CAMBRIDGE, MA 02139
CONTRACT NUMBER:
DR L D KAPLAN/R G ISAACS
TITLE:
SPECTROSCOPIC AND RETRIEVAL STUDIES IN SUPPORT OF SCRIBE
TOPIC# 73 OFFICE: AFGL/XOP

WE PROPOSE TO EXTEND THE WORK BEGUN IN PHASE I OF THIS EFFORT ALONG THREE INTERRELATED LINES OF INVESTIGATION. BASED ON THE CAPABILITIES DEVELOPED AND DEMONSTRATED IN PHASE I, WE WILL: (a) ENHANCE THE TEMPERATURE RETRIEVAL ALGORITHM FOR APPLICATION TO SCRIBE DATA ANALYSIS BY OPTIMIZING CHANNEL SELECTION BASED ON THE COMPLETED SENSITIVITY STUDIES AND APPLY TO BOTH NADIR AND LIMB SCANS FROM 1984 AND SUBSEQUENT DATA, (b) APPLY A CONSTITUENT RETRIEVAL CAPABILITY TO OBTAIN ESTIMATES OF RELEVANT TRACE GAS CONCENTRATIONS TO BE EXERCISED SUBSEQUENT TO THE TEMPERATURE RETRIEVAL ALGORITHM; IN PARTICULAR WE WILL SEARCH FOR LINES OF PHOTOCHEMICALLY ACTIVE MOLECULES WITH DIURNAL VARIATION TO HELP UNDERSTAND OZONE RELATED PHOTOCHEMISTRY AND DIURNAL VARIATIONS OF STRATOSPHERIC TRANSPARENCY; SCRIBE RETRIEVAL SPECIES CONCENTRATIONS WILL BE COMPARED TO THOSE

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PREDICTED FROM TWO DIMENSIONAL PHOTOCHEMICAL MODELS AND, AS APPROPRIATE, THE NASA SATELLITE DATA BASE, AND (c) CONTINUE AND EXTEND OUR INVESTIGATION OF LINE MIXING AND ITS POTENTIAL IMPACT ON MODELING OF STRATOSPHERIC BACKGROUND RADIANCES AND ACCURACY OF REMOTE SENSING OF TEMPERATURE AND TRACE CONSTITUENTS.

ATMOSPHERIC & ENVIRONMENTAL RSCH INC/AER AF
840 MEMORIAL DR
CAMBRIDGE, MA 02139
CONTRACT NUMBER: F04701-87-C-0145
R G ISAACS/DR R N HOFFMAN
TITLE:
A MULTISPECTRAL CLOUD PROPERTY SENSOR FOR DMSP
TOPIC# 58 OFFICE: AFSTC/OLAB

THE PHASE II PROGRAM PROPOSED IN THIS DOCUMENT EXPLOITS THE SIMULATION/RETRIEVAL CAPABILITIES DEVELOPED AND DEMONSTRATED IN PHASE I. WE PROPOSE TO APPLY THESE TOOLS TO DEFINE A MULTISPECTRAL CLOUD PROPERTY SENSOR FOR DMSP. THE SIMULATION MODELING CAPABILITY WILL BE USED TO IDENTIFY APPROPRIATE SPECTRAL REGIONS TO OBTAIN DESIRED INFORMATION ON SPECIFIED CLOUD PROPERTIES. THE RETRIEVAL CAPABILITY WILL BE EMPLOYED TO OPTIMIZE CHANNEL SELECTION AND ASSESS THE QUALITY (I.E. ACCURACY) OF THE RESULTANT CLOUD PROPERTY DETERMINATIONS. THESE CALCULATIONS WILL BE EXERCISED FOR A VARIETY OF REALISTIC EARTH BACKGROUND, ATMOSPHERIC PROFILE, CLOUD PROPERTY, AND SENSOR GEOMETRY SCENARIOS. THE STUDY WILL BE SUPPORTED BY ACTUAL DATA SAMPLES FROM EXISTING MULTISPECTRAL IMAGERS FOR TECHNIQUE DEVELOPMENT VERIFICATION AND VALIDATION. DATA ANALYSIS AND CLOUD PROPERTY RETRIEVAL FROM THE MULTISPECTRAL CLOUD PROPERTY SENSOR WILL BE INTEGRATED WITH POTENTIALLY USEFUL DATA FROM OTHER DMSP SENSORS PRIMARILY THOSE OF THE SUITE OF MICROWAVE INSTRUMENTS INCLUDING THE SSM/I IMAGER, THE SSM/T TEMPERATURE PROFILER, AND THE SSM/S-2 MOISTURE SOUNDER.

ATOM SCIENCES INC AF
114 RIDGEWAY CTR
OAK RIDGE, TN 37830
CONTRACT NUMBER:
DR JAMES E PARKS
TITLE:
CHARACTERIZATION III-V COMPOUNDS/ULTRASTRUCTURED MATERIALS USING SPUTTER INITIATED RESONANCE IONIZATION SPECTROSCOPY WITH HIGH LAT
TOPIC# 55 OFFICE: RADC/DOR

SUBMITTED BY DEPT

THE AIR FORCE IS INTERESTED IN MULTILAYERED, HETEROEPITAXIAL ULTRASTRUCTURES FOR USE IN SEMICONDUCTOR DEVICES AND AS STRUCTURAL MATERIALS. TAILOR-MADE BAND GAPS FOR SUCH DEVICES AS LASERS AND HIGH-ELECTRON-MOBILITY TRANSISTORS CAN BE PRODUCED BY GROWING III-V COMPOUNDS EPITAXIALLY IN MANY THIN LAYERS OF DIFFERENT COMPOSITION (QUANTUM-WELL LAYERING). OTHER LAYERED STRUCTURES CAN BE USED AS HIGH-STRENGTH AND/OR SUPERREFRACTORY MATERIALS FOR AIRPLANE COMPONENTS. HOWEVER, OBTAINING THE ULTIMATE PERFORMANCE FROM SUCH ULTRASTRUCTURES REQUIRES CONTROL OF THE LOCAL COMPOSITION OF THE LAYERS OVER DEPTHS PERTINENT TO QUANTUM WELL LAYERING, 100 TO 1000 A. THIS REQUIRES, IN TURN, AN ANALYTICAL TECHNIQUE SUPERIOR TO ANY NOW AVAILABLE, ONE HAVING HIGH LATERAL AND DEPTH RESOLUTION, AND GOOD SENSITIVITY INDEPENDENT OF MATRIX EFFECTS IN THE DIFFERENT MATERIALS OF THE LAYERS. A PHASE I SBIR FEASIBILITY STUDY SHOWED THAT SPUTTER INITIATED RESONANCE IONIZATION SPECTROSCOPY (SIRIS), A NEW LASER BASED TECHNIQUE, COULD MAKE MATRIX-INDEPENDENT, INTERFERENCE-FREE, HIGHLY SENSITIVE MEASUREMENTS OF ELEMENTS OF INTEREST WITH HIGH LATERAL AND DEPTH RESOLUTION. THIS PHASE II SBIR PROJECT PROPOSES TO IMPROVE THE SIRIS APPARATUS TO ACHIEVE ppm SENSITIVITY WITH 1000 A LATERAL RESOLUTION AND TO DEMONSTRATE IT IN ULTRASTRUCTURE MATERIALS OF STRATEGIC IMPORTANCE TO THE AIR FORCE.

AUGUST DESIGN & DEVELOPMENT ARMY
300 E LANCASTER AVE - STE 206
WYNNEWOOD, PA 19096
CONTRACT NUMBER:
DONALD E LEE
TITLE:
SCALE MODEL DEVELOPMENT OF AUTOMATED ALL-WEATHER CARGO TRANSFER SYSTEM (AACTS) COMPONENTS
TOPIC# 103 OFFICE: BRDEC

PHASE I DEFINED A CONCEPT FOR OFFSHORE CARGO TRANSFER BETWEEN CONTAINERSHIPS AND LIGHTERS AT SEA STATE 3 CONDITIONS OR HIGHER. THE SYSTEM IS CALLED THE AUTOMATED ALL-WEATHER CARGO TRANSFER SYSTEM (AACTS). UNDER PHASE II, THE DEVELOPMENT OF PROOF-OF-CONCEPT SCALE MODELS OF AACTS COMPONENTS IS PROPOSED. THE COMPONENTS SELECTED ARE THE MOST INNOVATIVE AND HOLD THE MOST PROMISE FOR BROAD NEAR-TERM MILITARY AND COMMERCIAL APPLICATION. THESE ARE DESCRIBED BELOW. THE CARGO MANIPULATOR ARM IS A SCALED UP VERSION OF AN INDUSTRIAL

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ROBOT AND IS USED TO TRANSFER SHIP'S CARGO. THIS ELIMINATES PROBLEMS SUCH AS PENDULATION. THE ISO COMPATIBLE INTELLIGENT SPREADER BAR CONSISTS OF SENSOR AND MOTION CONTROL SYSTEMS. IT ENABLE RAPID AND AUTOMATED ACQUISITION OF CARGO. A BRETHING MODULE IS A SURFACE WITH THE CAPABILITY OF MOVING IN SYNCHRONISM WITH A CRAFT TO IMPACT CONTROLLED FORCES WHICH CONSTRAIN THE MOVEMENT OF THE CRAFT. A LINEAR ARRAY OF MODULES CAN PROVIDE A "SOFT" DOCKING SURFACE AND CAN ALSO BE USED TO WARP AND RAPIDLY CAST OFF A VESSEL. THE CRAFT INTERLOCK INTERFACE ENABLES THE BRETHING MODULE TO ATTACH FIRMLY TO THE CRAFT. THIS IS NECESSARY IN ORDER TO EXERT LIMITED CONTROL OVER THE CRAFT MOTION.

AUSTIN RESEARCH ASSOCS DNA
1901 RUTLAND DR
AUSTIN, TX 78758
CONTRACT NUMBER: DNA87-C-0236
DR M L SLOAN
TITLE:
ANALYSIS OF HANE 1-10 SECOND MHD EMP
TOPIC# 1 OFFICE: AM

MODELING OF THE AMBIENT AND PROMPT IONSPHERIC CONDUCTIVITY REGIONS IN THE THIN LAYER APPROXIMATION ALLOWS AN ACCURATE AND COMPUTATIONALLY EFFICIENT METHOD OF DETERMINING THE TIME EVOLUTION, PROPAGATION, AND SIGNAL STRENGTH OF THE 1-10 SECOND MHD EMP ASSOCIATED WITH HIGH ALTITUDE NUCLEAR DETONATIONS.

AUTOMATION RESEARCH INC (SYSTEMS ENGR) ARMY
2917 E CHAPALA DR
LAS VEGAS, NV 89120
CONTRACT NUMBER:
DR GEORGE F MAUER
TITLE:
DEVELOPMENT OF A LOW COST NON-INTRUSIVE TORQUE TRANSDUCER
VEHICLES
TOPIC# 119 OFFICE: TACOM/AMSTA

THE OBJECTIVE OF THIS PHASE II RESEARCH PROJECT IS TO DEVELOP A PROTOTYPE LOW-COST NON-INTRUSIVE TRANSDUCER FOR THE MEASUREMENT OF

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THE CRANKSHAFT TORQUE ON AUTOMOTIVE ENGINES. THE TRANSDUCER IS ADDED TO AN EXISTING DRIVE TRAIN WITHOUT DRI E TRAIN MODIFICATIONS. TWO NON-CONTACTING ENCODER-MAGNETIC PICKUP COMBINATIONS DETECT THE PHASE ANGLE BETWEEN THE PULSE TRAINS, WHICH IS A MEASURE OF THE ENGINE TORQUE. A LOW-COST DIGITAL CIRCUIT WHICH INCLUDES A MICRO-PROCESSOR, SAMPLES AND PROCESSES THE RAW TORQUE DATA. THIS CONCEPT PROVIDES FOR STABLE TRANSDUCER OPERATION INDEPENDENT OF MOTOR SPEED AND VARYING AMBIENT TEMPERATURES. THE PHASE I RESEARCH DEMONSTRATED THAT THE CRANK SHAFT TORQUE IS DETECTED WITH HIGH RESOLUTION AND DETAIL, PERMITTING ON-LINE ENGINE DIAGNOSTICS, INCLUDING FAULT DETECTION ON INDIVIDUAL CYLINDERS.

BAND LAVIS & ASSOCS INC ARMY
670 RITCHIE HWY
SEVERNA PARK, MD 21146
CONTRACT NUMBER:
DAN WILKINS
TITLE:
EXPERIMENTAL VERIFICATION OF HIGH-SEA-STATE CONTAINER-TRANSFER SYSTEM (HISEACOTS)
TOPIC# 103 OFFICE: BRDEC

PHASE-I WORK ON THE U.S. ARMY BELVOIR RD&E CENTER SBIR CONTRACT "STABLIZATION OF THE SHIP/LIGHTER INTERFACE" HAS RESULTED IN THE DEVELOPMENT OF A CONCEPTUAL DESIGN OF A SYSTEM THAT IS EXPECTED TO IMPROVE THE ARMY'S ABILITY TO OFFLOAD CONTAINERS TO LACV-30s OR SIMILAR LIGHTERS IN A JLOTS MISSION IN SEA-STATES UP TO AT LEAST 4 CONDITIONS. THE CURRENT CAPABILITY IS LIMITED TO APPROXIMATELY SEA-STATE 2. IT IS ALSO EXPECTED TO IMPROVE OFFLOAD PRODUCTIVITY IN ALL SEA STATES. THE PROPOSED SYSTEM IS DESIGNATED THE HIGH-SEA-STATE CONTAINER-TRANSFER SYSTEM (HISEACOTS). THE DELIVERABLES OF THE PHASE I EFFORT WILL INCLUDE A FINAL REPORT (DUE 31 MARCH 1987), A BRIEFING (13 FEBRUARY 1987) ON WORK ACCOMPLISHED, A FEASIBILITY-LEVEL DESIGN OF THE HISEACOTS, AND A 1/30-SCALE MODEL OF THE HISEACOTS. DURING PHASE II IT IS PROPOSED TO CARRY OUT A SERIES OF FULL-SCALE VERIFICATION AND DEMONSTRATION TESTS OF THE PRINCIPAL COMPONENTS OF THE HISEACOTS SYSTEM. IT IS PROPOSED TO ENLIST THE SUPPORT OF AN ARMY LACV-30 AND OF THE NAVY SES TEST FACILITY AT LEXIGTON PARK, MARYLAND TO CONDUCT SOME OF THESE TESTS.

BELTRAN INC AF
1133 E 35TH ST
BROOKLYN, NY 11210
CONTRACT NUMBER:
MICHAEL R BELTRAN
TITLE:
STRUCTURAL PROPERTIES OF SOLID PROPELLANTS
TOPIC# 247 OFFICE: BMO/MYSC

SUBMITTED BY DEPT

SOLID PROPELLANT ROCKET MOTORS FOR HIGH ACCELERATING MISSILES, WITH LOW BURN-OUT ALTITUDE, ARE MORE DIFFICULT TO DESIGN DUE TO INCREASED FORCES RESULTING FROM HIGH DYNAMIC PRESSURES, HIGH PROPELLANT BURNING RATES AND PROPELLANT GRAIN DEFORMATION. DEFORMATION REDUCES THE PORT AREA WHICH CAN RESULT IN INCREASED CHAMBER PRESSURE AND FAILURE OF THE GRAIN DUE TO DEBONDING AND TEARING. IN ADDITION TO ENHANCING THE STRUCTURAL PARAMETERS, IT IS DESIRABLE TO INCREASE THE PROPELLANT'S BURNING RATE AND SPECIFIC IMPULSE. METALS, LIKE ALUMINUM, HAVE BEEN ADDED TO SOLID PROPELLANTS TO IMPROVE SPECIFIC IMPULSE. USUALLY, METALS HAVE BEEN ADDED IN POWDER FORM, BUT IT IS POSSIBLE TO USE FIBERS, WIRES, FOIL, AND SCREENS OF THESE MATERIALS TO ENHANCE STRENGTH, PERFORMANCE, AND BURNING RATE. THE PHASE I STUDY DEFINED THE LIMITS OF STRUCTURAL ENHANCEMENT POSSIBLE AND THE LOADS INDUCED BY VARIOUS MISSION PROFILES. THE PHASE II PROGRAM WILL DEVELOP ANALYTICAL AND EXPERIMENTAL RESULTS FOR THE MOST PROMISING REINFORCEMENT CONCEPTS. THIS WORK INCLUDES FURTHER DEFINITION OF LOADS AND STRESS ANALYSIS OF THE ROCKET MOTORS, THE DESIGN, AND TENSION TESTING OF REINFORCED PROPELLANT AND THE FIRING OF 2x4 ROCKET MOTORS. IN PARTICULAR, METHODS OF GRAIN REINFORCEMENT UTILIZING PARTICLE SIZE CONTROL, ISOTROPIC, AND ANISOTROPIC FIBER ORIENTATION WILL BE EVALUATED.

BEND RESEARCH INC AF
64550 RESEARCH RD
BEND, OR 97701
CONTRACT NUMBER: F33615-87-C-2813
DR DWAYNE T FRIESEN
TITLE:
THIN-FILM-COMPOSITE MEMBRANES FOR ON-BOARD INERT GAS GENERATION
TOPIC# 178 OFFICE: AFWAL/PO

AIRCRAFT FUEL TANKS CAN BE PROTECTED FROM FIRE AND EXPLOSION BY FILLING THE VAPOR SPACE ABOVE THE LIQUID FUEL WITH INERT NITROGEN GAS. A LOW-MAINTENANCE, MEMBRANE-BASED ON-BOARD INERT-GAS GENERATION SYSTEM (OBIGGS) IS A PROMISING ALTERNATIVE TO CURRENT HIGH-MAINTENANCE LIQUID-NITROGEN SYSTEMS. DURING PHASE I WE DEVELOPED A NOVEL MEMBRANE FOR SEPARATION OF NITROGEN FROM AIR, CONDUCTED EXPERIMENTS WITH THAT MEMBRANE, AND DESIGNED A MEMBRANE-BASED OBIGGS USING THE MEMBRANE'S MEASURED PERMEABILITY CHARACTERISTICS. CALCULATIONS INDICATE THAT AN AIR-SEPARATION MODULE BASED ON THE CURRENT

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MEMBRANE WOULD WEIGH UP TO FIVE TIMES LESS THAN ANY CONVENTIONAL MODULE. THE PHASE II PROGRAM SHOULD AT LEAST DOUBLE THAT WEIGHT SAVINGS. IN PHASE II WE PROPOSE TO FURTHER REFINE THE MEMBRANE-FABRICATION PROCEDURE, INCORPORATE THE MEMBRANE ONTO A HOLLOW-FIBER SUPPORT MEMBRANE, AND DESIGN, CONSTRUCT, AND OPERATE A HOLLOW-FIBER MEMBRANE MODULE FOR PRODUCTION OF NITROGEN-ENRICHED AIR. A DEFENSE CONTRACTOR EXPERIENCED IN OXYGEN- AND NITROGEN-ENRICHED-AIR SYSTEMS HAS TENTATIVELY AGREED TO FUND THE INTERIM PERIOD BETWEEN PHASE I AND PHASE II; FURTHERMORE, THE COMPANY WILL FUND AND SUPPORT COMMERCIALI-ZATION UPON THE SUCCESSFUL COMPLETION OF PHASE II.

BERNER LANPHIER & ASSOCS AF
7315 WISCONSIN AVE - STE 429W
BETHESDA, MD 20814
CONTRACT NUMBER: F04701-87-C-0138
STEVEN D BERNER
TITLE:
DEVELOPMENT OF LAUNCH VEHICLE COST MODEL
TOPIC# 59 OFFICE: AFSTC/OLAB

THE OVERALL OBJECTIVE OF THIS PROJECT IS TO DEVELOP A PARAMETRIC LAUNCH VEHICLE COST MODEL FOR LAUNCH VEHICLE HARDWARE PRODUCTION AND DEVELOPMENT, OPERATIONS AND SUPPORT (O&S), AND PAYLOAD INTEGRATION. IN ADDITION, DATABASES OF LAUNCH VEHICLE COSTS AND TECHNICAL CHARAC-TERISTICS WILL BE DEVELOPED. THE MODEL WILL USE THE TECHNICAL CHARACTERISTICS OF PROPOSED LAUNCH VEHICLES TO GENERATE ESTIMATES OF HARDWARE PRODUCTION AND DEVELOPMENT COSTS. BY A SIMILAR PROCESS, THE MODEL WILL GENERATE O&S AND PAYLOAD INTEGRATION COST ESTIMATES. TO REALIZE THIS OBJECTIVE, DATA WILL BE GATHERED ON LAUNCH VEHICLE HARDWARE PRODUCTION AND DEVELOPMENT, O&S, PAYLOAD INTEGRATION COSTS. THE DATA WILL BE NORMALIZED TO INSURE DATA COMPATIBILITY. DATA WILL BE GATHERED ON THE CHARACTERISTICS OF LAUNCH VEHICLE HARDWARE TECH-NICAL SPECIFICATIONS, AND O&S, AND PAYLOAD INTEGRATION PROCEDURES. COMPUTERIZED DATABASES OF THE COST AND TECHNICAL DATA WILL BE IMPLE-MENTED. THE FINAL STEP IN THIS PROJECT IS TO CORRELATE THE COST DATA WITH THE APPROPRIATE TECHNICAL DATA AND DEVELOP COST ESTIMATING RELATIONSHIPS (CERs). THESE CERs WILL BE USED TO DEVELOP THE LAUNCH VEHICLE COST MODEL.

BIO-METRIC SYSTEMS INC NAVY
9932 W 74TH ST
EDEN PRAIRIE, MN 55344
CONTRACT NUMBER:
DR PETER H DUQUETTE
TITLE:
CHEMICAL INTELLIGENCE FOR AUTOMATED SYSTEMS: CHEMILUMINESCENT ENZYME IMMUNO ASSAY DEVICE FOR TOXINS
TOPIC# 2 OFFICE: ONR

SUBMITTED BY DEPT

THE CONTRACTOR WILL OPTIMIZE CHEMISTRY FOR THE IMMOBILIZATION OF COMPONENTS OF AN ENZYME IMMUNOASSAY FOR REVERSIBLE DETECTION OF T-2 TOXIN. HETEROBIFUNCTIONAL CROSSLINKING REAGENTS FOR INTERMOLECULAR PROTEIN COUPLING WILL BE PREPARED. THE COMPONENTS OF A REVERSIBLE ENZYME IMMUNOASSAY FOR T-2 TOXIN WILL BE ASSEMBLED AND TESTED.

BIOTEK INC ARMY
21-C OLYMPIA AVE
WOBURN, MA 01801
CONTRACT NUMBER:
DR MICHAEL H GAY
TITLE:
ANTIMICROBIAL WOUND DRESSING
TOPIC# 214 OFFICE: AMRDCSGRD

THE MAIN OBJECTIVE OF PHASE I OF THIS SBIR PROJECT WAS TO DEMONSTRATE THE FEASIBILITY FOR SUCCESSFUL DEVELOPMENT OF AN ANTIMICROBIAL WOUND DRESSING BASED ON A HYDROGEL SUSTAINED RELEASE MATRIX. THIS GOAL HAS BEEN ACHIEVED. IN VITRO STUDIES OF DRUG DIFFUSION HAVE DEMONSTRATED THAT BIOTEK WOUND DRESSINGS CAN RELEASE ANTIMICROBIAL AGENTS FOR UP TO ONE WEEK. WOUND DRESSINGS BASED ON POLYVINYL ALCOHOL, POLYHYDROXYETHYL METHACRYLATE, POLYACRYLAMIDE AND POLYETHYLENE OXIDE HAVE BEEN EVALUATED. RELEASE RATES ARE DEPENDENT UPON WATER CONTENT, DEGREE OF HYDROGEL CROSSLINKING, CONCENTRATION OF PLASTICIZER, POLYMER MOLECULAR WEIGHT, DEGREE OF HYDROLYSIS OF POLYVINYL ALCOHOL, AND SOLUBILITY OF THE ANTIMICROBIAL AGENT. A WIDE RANGE OF RELEASE RATES MAY BE ACHIEVED BY SELECTION OF THE PROPER HYDROGEL MATRIX. POLYVINYL ALCOHOL BASED HYDROGELS CONTAINING EITHER TETRACYCLINE FREE BASE OR CHLOREHEXIDINE DIPHOSPHANILATE WERE EFFICACIOUS IN VIVO IN A WOUND MODEL WITH AN ESTABLISHED STREPTOCOCCUS PYOGENES INFECTION. IN ADDITION CHLORHEXIDINE DIPHOSPHANILATE HYDROGELS WERE EFFICACIOUS AGAINST ESTABLISHED STAPHYLOCOCCUS AUREUS INFECTIONS AND MIXED INFECTIONS CONTAINING BOTH ORGANISMS.

BISTA RESEARCH INC NAVY
22A SPARROW HAWK CT
GREER, SC 29651
CONTRACT NUMBER:
DR KARL M BYSTRICKY
TITLE:
DEVELOPMENT OF AN EXPENDABLE ZOOM LENS ASSEMBLY FOR A REMOTELY PILOTED VEHICLE
TOPIC# 154 OFFICE: NAVAIR/NADC

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PHASE II DEVELOPMENT OF AN OPTIMIZED ZOOM LENS ASSEMBLY AS DESCRIBED IN SBIR TOPIC N86-154 AND SHOWN THROUGH PHASE I STUDY TO BE FEASIBLE BUT WITH IMPROVED AND EXTENDED PARAMETERS AND PERFORMANCE IS PROPOSED. ONE OVERALL OBJECTIVE OF THIS DEVELOPMENT IS TO FINALIZE THE NEW OPTICAL DESIGN AND TO DEMONSTRATE ANALYTICALLY THAT THIS LENS OFFERS APPROPRIATE OPTICAL CHARACTERISTICS AND PERFORMANCE AND RANDOM, WITHIN TOLERANCE VARIATIONS OF MANUFACTURING PARAMETERS. REMOTELY ADJUSTABLE FOCAL LENGTH OF 15 TO 75 mm AND 30 TO 150 mm (5X ZOOM RANGE WITH 2X EXTENDER), FIXED APERTURE OF f/1.8, MINIMUM BARREL LENGTH, MINIMUM DIAMETER, MINIMUM OPTICAL ELEMENT WEIGHT AND FIELD OF VIEW COMMENSURATE WITH IMAGING ON COMMERCIALLY AVAILABLE 6.6 X 8.8 mm CCD DETECTOR ARRAYS ARE PRIME CHARACTERISTICS. A SECOND OVERALL OBJECTIVE OF THE CONTRACT IS TO DEVELOP A FINAL MECHANICAL DESIGN FOR THE LENS ASSEMBLY AND TO DELIVER PRINTS OF MANUFACTURING DRAWINGS FROM WHICH PROTOTYPES CAN BE BUILT. FABRICATION OF HARDWARE IS NOT INCLUDED IN THIS PROPOSAL.

BKM INC ARMY
5141 SANTA FE ST
SAN DIEGO, CA 92109
CONTRACT NUMBER:
N J BECK
TITLE:
FUEL INJECTION RETROFIT FOR IMPROVED DIESEL ENGINE PART LOAD PERFORMANCE
TOPIC# 114 OFFICE: TACOM/AMSTA

IDLE AND PART LOAD PERFORMANCE OF A DIESEL ENGINE IS GENERALLY UNATTRACTIVE BECAUSE OF THE POOR SPRAY CHARACTERISTICS OF CLASSICAL FUEL INJECTION SYSTEMS, TOGETHER WITH THE MARGINAL PERFORMANCE OF PREVAILING TURBOCHARGER DESIGN UNDER THESE KIND OF OFF-DESIGN CONDITIONS. THE RESULTING HIGH FUEL CONSUMPTION, SMOKE AND MAINTENANCE COSTS ALL REPRESENT COMPELLING REASONS TO DEVELOP IMPROVED SYSTEMS. THE SUCCESSFUL TESTING OF THE PHASE I PROGRAM IS DEMONSTRATING THE MERITS OF THE SPECIAL SERVOJET EXPANDING CLOUD INJECTION SYSTEM (ECIS). BECAUSE THE PRINCIPLE OF OPERATION EFFECTIVELY PROVIDES GOOD INJECTION REGARDLESS OF SPEED OR LOAD, STARTING AND PART LOAD PERFORMANCE WAS PARTICULARLY IMPROVED. THE PHASE II OFFERING HEREIN COMBINES THE FULL SERVOJET ELECTRONICALLY CONTROLLED FUEL SYSTEM TOGETHER WITH A PROPOSED ADVANCED TURBOCHARGER DESIGN. TESTS WILL

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BE CONDUCTED TO DETERMINE IMPROVEMENTS IN SPECIFIC POWER FUEL CONSUMPTION SMOKE AND TRANSIENT RESPONSE WITH EMPHASIS ON THE LATTER IN LOW LOAD AND SPEED REGIMES. THE PROPOSAL INCLUDES THE COST OF A PROTOTYPE SYSTEM SPECIFICALLY DESIGNED FOR INSTALLATION ON AN ENGINE IN CURRENT USE. THE SPECIAL TURBOCHARGING SYSTEM WILL BE DESIGNED FOR THE SAME ENGINE AND A PROTOTYPE PRODUCED TO TEST TOGETHER WITH THE FUEL SYSTEM. THE TESTS WILL STRESS RELATIVE IMPROVEMENTS IN THE CATEGORIES LISTED ABOVE.

BREWER SCIENCE INC AF
PO BOX GG - 2401 HIGH TECH DR
ROLLA, MO 65401
CONTRACT NUMBER: F33615-87-C-5348
DR TERRY BREWER
TITLE:
PREPARATION OF MOLECULAR COMPOSITES BY AN INSITU MATRIX/INSITU ROD APPROACH
TOPIC# 166 OFFICE: AFWAL/ML

LARGE GAINS IN IMPACT AND FRACTURE STRENGTH CAN BE OBTAINED BY REINFORCING PLASTIC MATRICES WITH RIGID ROD POLYMER PHASES. MAXIMUM MECHANICAL PROPERTIES RESULT WHEN THE RIGID ROD POLYMER IS MOLECULARLY DISPERSED. AT THE MOMENT, COCASTING THE MATRIX AND ROD PHASES FROM DILUTE, ISOTROPIC SOLUTION IS THE ONLY METHOD FOR PRODUCING THESE MOLECULAR COMPOSITES. THE STRONG TENDENCY FOR THE ROD COMPONENT TO PHASE SEPARATE, EITHER IN SOLUTION OR IN THE COAGULANT, HOWEVER, CAUSES MANY COMPLICATIONS IN PROCESSING AND HAMPERS THE FURTHER DEVELOPMENT OF MOLECULAR COMPOSITES. PHASE I STUDIES HERE HAVE INDICATED THAT AN INSITU MATRIX-INSITU ROD APPROACH HAS POTENTIAL FOR CIRCUMVENTING THESE LIMITATIONS. IN THIS NEW METHOD, AN EASILY MANIPULATED, SOLID PRECURSOR IS THERMALLY REARRANGED TO PRODUCE A RIGID ROD PHASE DISPERSED IN A THERMOPLASTIC MATRIX. THIS PROPOSAL SCOPES THE DEVELOPMENT OF MATERIALS AND PROCESSES SUITABLE FOR THE PRODUCTION OF MOLECULAR COMPOSITES BY INSITU MATRIX/INSITU ROD METHODS.

BRIMROSE CORP OF AMERICA NAVY
7720 BELAIR RD
BALTIMORE, MD 21236
CONTRACT NUMBER:
DR RONALD G ROSEMEIER
TITLE:
UNIQUE TECHNIQUE FOR REAL TIME CHARACTERIZATION OF RDX/HMX BASED COMPOSITES
TOPIC# 128 OFFICE: NWC/SSPO

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PARTICLE SIZE, SEGREGATION AND COMPOSITE HOMOGENIETY ARE SOME OF THE CRITICAL PARAMETERS AFFECTING PROPELLANT PERFORMANCE. SEVERAL INVESTIGATIONS HAVE BEEN UNDERTAKEN TO RESOLVE THIS ISSUE. THE CURRENT STUDY INVOLVES THE USE OF REAL TIME X-RAY DIFFRACTION EXPERIMENTS TO QUANTIFY THE ABOVE MENTIONED PARAMETERS. 2-D X-RAY DETECTORS IN COMBINATION WITH STATE-OF-THE-ART IMAGE PROCESSING HARDWARE/SOFTWARE HAVE SIGNIFICANTLY ENHANCED THE ANALYTICAL CAPABILITIES. SEVERAL COMPOSITES AND SIMULANTS HAVE BEEN EXAMINED USING THESE TECHNIQUES. A PROCEDURE FOR X-RAY "FINGER PRINTING" INDIVIDUAL CONSTITUENTS IN COMPOSITES HAS BEEN SUCCESSFULLY IMPLEMENTED. ALGORITHMS HAVE ALSO BEEN DEVELOPED FOR PARTICLE SIZE AND DISTRIBUTION ANALYSIS. ADDITIONALLY, THESE TECHNIQUES CAN ALSO BE USED TO DETERMINE MICRO-LATTICE STRAIN STATES IN VARIOUS CONSTITUENTS IN THE COMPOSITES. ALL X-RAY METHODS USED ARE FIRMLY BASED ON 1ST PRINCIPLES (BRAGG'S LAW OF X-RAY DIFFRACTION). INTEGRATION WITH DIGITAL IMAGING AND ADVANCED COMPUTING TECHNIQUES MAKES EXPERT SYSTEM DESIGN VIABLE AND EXTREMELY LUCRATIVE FOR PRODUCTION FEED BACK CONTROL. PHASE I RESULTS HAVE CLEARLY SHOWN FEASIBILITY OF UTILIZING X-RAY DIFFRACTION TECHNIQUES FOR CHARACTERIZING A WIDE VARIETY OF PROPELLANT COMPOSITES. ONE OF THE LIMITING FACTORS IN THE PHASE I EFFORT WAS THE LOW INTENSITY OF THE X-RAY SOURCE USED. DESPITE THIS LIMITATION, DISCERNABLE SIGNALS WERE OBSERVED FROM PARTICLE SIZE RANGING FROM 4um TO 150um FOR A WIDE VARIETY OF MATERIALS (RDX, HMX, AP, ETC.). IN ORDER TO IMPROVE THE SIGNAL TO NOISE RATIO, IT IS PROPOSED IN PHASE II TO UTILIZE A ROTATING ANODE X-RAY GENERATOR. SUCH AND X-RAY GENERATOR WILL PROVIDE ROUGHLY AN ORDER OF MAGNITUDE HIGHER X-RAY INTENSITY AND WILL THUS ALLOW THE IMAGING SYSTEM DEVELOPED IN PHASE I TO RESOLVE SMALLER PARTICLE SIZE INFORMATION.

BROWN J ASSOCS INC AF
PO BOX 145
BERKELEY HEIGHTS, NJ 07922
CONTRACT NUMBER: F33615-87-C-3421
DR JOHN A BROWN
TITLE:
FUEL TANK ULLAGE VAPOR ANALYZER
TOPIC# 125 OFFICE: AFWAL/FI

THE VAPOR SPACE INSIDE AN AIRCRAFT FUEL TANK IS OR IS NOT FLAMMABLE (OR EXPLOSIVE) DEPENDING UPON THE PERCENTAGE OF FUEL VAPOR AND OF

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OXYGEN AND OF INERT GAS SUCH AS NITROGEN OR HALOCARBON FIRE SUPPRESSANTS. IT IS IMPORTANT TO KNOW THESE PERCENTAGES WHEN TESTING THE EFFICACY OF EXPERIMENTAL INERTING MEASURES BY FIRING LIVE ROUNDS AT TEST TANKS; BUT THERE HAS BEEN NO FAST, CONVENIENT, FIELD METHOD OF MEASURING THE PERCENTAGES HERETOFORE. PHASE I DEMONSTRATED THE FEASIBILITY OF ANALYZING FOR FUEL VAPOR, OXYGEN, NITROGEN AND HALON BY A DEDICATED GAS CHROMATOGRAPH WITH A TIME LAG OF ONLY ONE TO THREE MINUTES, WHICH IS ESSENTIALLY REAL TIME. PHASE II OFFERS TO ENGINEER, FABRICATE AND INSTALL A PERMANENT AUTOMATED ULLAGE CHROMATOGRAPH AT THE AFWAL AIRCRAFT SURVIVABILITY RESEARCH FACILITY. CONTROL ROOM READOUT IS TO INCLUDE A STRIPCHART CHROMATOGRAM, AN ALPHANUMERIC COMPOSITION SUMMARY AND A REAL-TIME PLOT ON A FLAMMABILITY DIAGRAM.

BUSINESS & TECHNOLOGICAL SYSTEMS INC ARMY
10210 GREENBELT RD - STE 440
SEABROOK, MD 20706
CONTRACT NUMBER:
BRUCE P GIBBS
TITLE:
DEVELOPMENT AND DEMONSTRATION OF PASSIVE SINGLE-SITE TARGET TRACKING ALGORITHM FOR ESM TRACKERS
TOPIC# 60 OFFICE: CECOM/AMSEL

A PASSIVE SINGLE-SITE ESM TARGET RANGING (AND TARGETING) TECHNIQUE SHOULD BE A VALUABLE ENHANCEMENT TO EXISTING ESM OPERATIONAL CAPABILITIES IN THAT IT AVOIDS THE COORDINATION AND MULTI-TARGET/MULTI-SITE CORRELATION PROBLEMS. THE PHASE I ANALYSIS OF THE GROUND-TO-AIR PROBLEM SHOWED MUCH PROMISE FOR THE TECHNIQUE IF DOPPLER FREQUENCY CAN BE MEASURED WITHIN 1 KHz. SINCE THERE IS CURRENTLY MORE INTEREST IN APPLICATION OF THE TECHNIQUE TO THE AIR-TO-AIR AND AIR-TO-GROUND PROBLEMS (E.G., RPV PLATFORMS), THIS PHASE II PROPOSAL ADDRESSES THE FURTHER DEVELOPMENT OF THE ALGORITHM AND A REALISTIC DEMONSTRATION OF THE TECHNIQUE USING AN AIRBORNE ESM RECEIVER. THE ALGORITHM WOULD BE REFINED USING A MORE REALISTIC SIMULATION, THE REAL-TIME DESIGN WOULD BE IMPLEMENTED ON A MICROCOMPUTER WHICH INTERFACES WITH AN ESM RECEIVER/SIGNAL PROCESSOR AND THE AIRCRAFT NAVIGATION SYSTEM, AND A TEST PLAN WOULD BE DEVELOPED. AFTER COMPLETION OF THE TEST, THE RESULTS WOULD BE ANALYZED AND DOCUMENTED. IN ADDITION, THE FEASIBILITY OF MEASURING DOPPLER FREQUENCY TO THE

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REQUIRED ACCURACY WILL BE ANALYZED.

CARBORIDE CORP ARMY
2020 LAKESIDE AVE
CLEVELAND, OH 44114
CONTRACT NUMBER:
L WILLIAM SAHLEY
TITLE:
HIGH TEMPERATURE DIESEL ENGINE PISTON CAP MATERIAL SYSTEMS
TOPIC# 114 OFFICE: TACOM/AMSTA

CARBORIDE CORPORATION HAS DEVELOPED A NEW THICK THERMAL BARRIER (.125 INCHES) CERAMIC/METALLIC COATING CAPABLE OF WITHSTANDING 2300 DEG F FOR USE ON IRON DIESEL PISTONS. AN EARLIER VERSION OF AN 1800 DEG G COATING SURVIVED 30 HOUR ENGINE TESTS, BUT PARTIALLY FAILED JUST UNDER 50 HOURS. THE NEW COATING STRUCTURE IS SUBSTANTIALLY STRONGER AND CRACK RESISTANT AND COMPLETELY SEALED TO PROTECT THE UNDERLYING CERAMIC AGAINST THE HOSTILE COMBUSTION ENVIRONMENT. IT IS NOW PROPOSED TO CONDUCT PHASE II TO PROVE OUT AND OPTIMIZE THE COATING STRUCTURE WITH ENGINE TESTING.

CARLOW ASSOCS INC ARMY
8315 LEE HWY
FAIRFAX, VA 22031
CONTRACT NUMBER:
THOMAS B MALONE
TITLE:
ADVANCED HUMAN ENGINEERING TOOLS
TOPIC# 133 OFFICE: LABCOM/HEL

THIS PROPOSED EFFORT IS DIRECTED AT DEVELOPING A STANDARDIZED PROCESS FOR CONDUCTING A HUMAN FACTORS ENGINEERING (HFE) FRONT-END ANALYSIS (FEA) IN THE CONCEPT EXPLORATION PHASE OF SYSTEM DEVELOPMENT. THE PROPOSAL DESCRIBES THREE OPTIONS: OPTION 1 PRODUCES A SET OF REQUIREMENTS AND A PRELIMINARY PROCESS FOR HFE FEA. OPTION 2 ADDS TO THE PRODUCTS OF OPTION 1 THE DEVELOPMENT OF HUMAN FACTOR ENGINEERING TOOLS SUCH AS AUTOMATED TASK ANALYSIS, A CONCEPT FOR A CONCEPT EXPLORATION HUMAN FACTORS ENGINEERING DATA BASE, AND A COGNITIVE WORKLOAD ASSESSMENT TECHNIQUE. OPTION 3 ADDS TO OPTION 2 A HUMAN

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FACTORS ENGINEERING DATA BASE AND AN EXPERT SYSTEM TO ASSIST THE HUMAN FACTORS ENGINEERING PRACTITIONER IN THE CONDUCT OF A FEA. THE FINAL PRODUCTS OF THE TOTAL EFFORT WILL STANDARDIZE THE METHODOLOGY FOR CONDUCTING A HIGHER QUALITY HUMAN FACTORS ENGINEERING FRONT-END ANALYSIS AT REDUCED TIME, EFFORT AND DOLLAR COST.

CAS INC ARMY
PO BOX 11190 - 650 DISCOVERY DR
HUNTSVILLE, AL 35814
CONTRACT NUMBER:
JOHN R ROBBINS
TITLE:
RADOME ERROR COMPENSATION BY ESTIMATION OF STRUCTURED SIGNALS (RECESS)
TOPIC# 111 OFFICE: MICOM

THE PHASE I EFFORT RESULTED IN THE DEVELOPMENT OF A TECHNIQUE CALLED RADOME ERROR COMPENSATION BY ESTIMATION OF STRUCTURED SIGNALS (RECESS). THE FAMILY OF ALGORITHMS DEVELOPED ALLOWS FOR THE DEFINITION OF AN ESTIMATOR/COMPENSATOR THAT DEPENDS ONLY ON THE SIGNAL MODELS OF THE COMMAND INPUT AND RADOME ERROR INDUCED DISTURBANCE WAVEFORM STRUCTURES, AND IS INDEPENDENT OF THE PLANT (MISSILE) DYNAMICS. THE PRIMARY OBJECTIVES OF THE PHASE II EFFORT WILL BE: 1. TO EXPAND THE ALGORITHM TO INCLUDE SIGNAL MODELS UP TO THE ORDER DETERMINED TO BE REQUIRED FOR A RADOME ERROR ESTIMATOR/COMPENSATOR IN A TYPICAL INTERCEPTOR MISSILE SYSTEM. 2. TO EXERCISE THE EXPANDED ALGORITHM IN THE SIMPLIFIED MODEL DEVELOPMENT UNDER PHASE I IN ORDER TO DETERMINE THE EFFECTS OF VARYING THE DESIGN PARAMETERS. 3. TO IMPLEMENT AND TEST THE ESSP ALGORITHM IN A DETAILED SIMULATION OF A CURRENT INTERCEPTOR MISSILE SYSTEM.

CASTLE TECHNOLOGY CORP SDIO
262 W CUMMINGS PK
WOBURN, MA 01801
CONTRACT NUMBER:
DR J PAUL PEMSLER
TITLE:
HIGH ENERGY/POWER DENSITY RAPID DISCHARGE BATTERIES
TOPIC# 5 OFFICE:

SUBMITTED BY DEPT

BATTERY CONFIGURATIONS WITH MICROELECTRODES GEOMETRIES COMBINED REDUCED INTERELECTRODE SPACING, ACCESSIBILITY OF ELECTROLYTE AND HIGH ELECTRODE SURFACE AREAS. CONSIDERABLE PROGRESS HAS BEEN MADE IN FABRICATING AND DISCHARGING PROTOTYPE CELLS WITH MICROELECTRODES. THE TECHNICAL APPROACH WAS BASED ON THE APPLICATION OF THIN FILM PROCESSING METHODS TO PREPARE INTRICATE ANODE AND CATHODE PATTERNS. THIS TECHNOLOGY IS BEING FURTHER DEVELOPED TO PRODUCE PROTOTYPE CELLS WITH DRAMATIC IMPROVEMENTS IN MASS TRANSFER, THERMAL MANAGEMENT AND POWER DENSITY. RIGID, PARALLEL-PLATE PATTERNS WITH MICRON INTERELECTRODE SPACINGS ARE BEING EMPLOYED TO ELIMINATE MICROPOROUS SEPARATORS AND REDUCE INTERNAL CELL RESISTANCE. THREE CELL TYPES ARE BEING DEVISED FOR CARBON, MANGANESE DIOXIDE AND SILVER OXIDE CATHODES. DISCHARGE CHARACTERISTICS OF CELLS ARE BEING MEASURED. A TWO DIMENSIONAL MATHEMATICAL MODEL IS BEING DEVELOPED THAT IS BEING USED TO ASSESS THE LIMITS OF CELL PERFORMANCE AND ESTABLISH OPTIMUM CELL GEOMETRIES. MICROELECTRODE BATTERY CONFIGURATIONS, WHEN SUCCESSFULLY DEVELOPED, CAN LEAD TO A NEW GENERATION OF HIGHLY RELIABLE AND EFFICIENT POWER SOURCES. PRIMARY AND SECONDARY BATTERIES USING SINGLE OR BIPOLAR ELECTRODES OPERATING IN SINGLE OR PULSED DISCHARGE MODES ARE BEING ENVISIONED. THE CONCEPT HAS APPLICATIONS IN A WIDE VARIETY OF ELECTROCHEMICAL DEVICES INCLUDING FUEL CELLS, SENSORS AND INTEGRATED CIRCUIT MICROCIRCUIT SOURCES.

CERAMATEC INC SDIO
163 W 1700RD S
SALT LAKE CITY, UT 84115
CONTRACT NUMBER:
NEILL WEBER
TITLE:
SODIUM HEAT ENGINE DEVELOPMENT
TOPIC# 5 OFFICE:

THE SODIUM HEAT ENGINE (SHE) IS A THERMALLY REGENERATIVE ELECTROCHEMICAL DEVICE POWERED BY A HEAT SOURCE AT 700-1000C AND REJECTING HEAT TO A CONDENSER AT 100-500C. THERE ARE NO MOVING PARTS IN THE ENGINE EXCEPT SLOWLY CIRCULATING LIQUID. PROSPECTS APPEAR TO BE GOOD FOR A SILENT, DURABLE, STATIC, LOW MAINTENANCE OPERATION AND FOR EFFICIENT, LOW MAINTENANCE THERMOELECTRIC CONVERSION FOR SPACE POWER APPLICATIONS. A CIRCULATING TEST CELL SYSTEM (CTCS) THAT CAN BE ADAPTED TO PERFECT SYSTEMS FOR OPERATING IN LOW GRAVITY WAS BUILT

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IN A PREVIOUS RESEARCH PHASE. UNDER THE CURRENT RESEARCH, CANDIDATE SHE SYSTEM COMPONENTS AND MATERIALS ARE BEING CONSTRUCTED AND TESTED FOR UTILITY AND DURABILITY, AND THE OPTIMIZATION OF A SHE DEVICE IS BEING ADDRESSED FOR OPERATING IN SPACE. WHEN SUCCESSFULLY DEMONSTRATED, A CAPABILITY WILL EXIST FOR DEVELOPING A PRACTICAL THERMOELECTRIC CONVERTER FOR SPACE, SOLAR, AND INDUSTRIAL APPLICATIONS.

CHASE CONSULTING INC AF
3543 CAMINITO CARMEL LANDING
SAN DIEGO, CA 92130
CONTRACT NUMBER:
LEONID B VOLFSON
TITLE:
INITIAL PROCESSING OF SPACE SHUTTLE CLOUD PHOTOGRAPHS
TOPIC# 74 OFFICE: AFGL/XOP

AN INNOVATIVE TECHNIQUE HAS BEEN DEVELOPED TO DIGITIZE AND RECTIFY THE MONOCHROME TRANSPARENCIES TAKEN BY THE CREW OF THE SPACE SHUTTLE WITH THE HAND-HELD CAMERA. THIS PROJECT BUILDS ON THREE PHASE I ACCOMPLISHMENTS: 1. AN APPROPRIATE TECHNIQUE HAS BEEN DEVELOPED AND IMPLEMENTED FOR HIGH RESOLUTION DIGITIZATION OF THE SPACE SHUTTLE TRANSPARENCIES. 2. AN ALGORITHM FOR RECTIFICATION THAT WILL PROVIDE ANGLE FROM NADIR, GEOGRAPHICAL AND SCALE INFORMATION THAT CAN BE ASSOCIATED WITH EACH FEATURE ON THE TRANSPARENCIES HAS BEEN CREATED AND REFINED. 3. THE STATISTICAL CLOUD CLASSIFICATION TECHNIQUE TO ASSESS THE SPATIAL VARIABILITY OF THE CLOUD FIELDS HAS BEEN APPLIED AND INCORPORATED IN A SOFTWARE ENVIRONMENT FOR AN INTERACTIVE GRAPHICS TERMINAL. THE SPECIFIC TECHNICAL OBJECTIVES OF THIS PROPOSAL, INTENDED TO BRING THIS NEW TECHNOLOGY TO OPERATIONAL READINESS, ARE: 1. ADDITIONAL DIGITIZATION OF SEQUENCES, INCLUDING ONES FROM LARGE-FORMAT CAMERA. 2. ADDITIONAL ANALYSIS OF SEQUENCES, INCLUDING CLOUD VERTICAL EXTENT CALCULATIONS. 3. CLOUD TYPING THROUGH CLASSIFICATION TECHNIQUES. 4. AUTOMATIC HANDLING OF PROBLEMS IN PROCESSING (SUN-GLINT, GLITCHES, ETC.). 5. FLIGHT SIMULATION THROUGH AND ABOVE CLOUD FIELD PRODUCED FROM SEQUENCES. 6. APPLY ARTIFICIAL INTELLIGENCE CONCEPTS TO FURTHER AUTOMATE THE ALGORITHMS BY IMPLEMENTING IT IN AN EXPERT SYSTEM. 7. INCORPORATE THE SOFTWARE IN A WORK STATION SUITABLE FOR USE IN AN OPERATIONAL ENVIRONMENT BY GOVERNMENT AND COMMERCIAL USERS.

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CIM SYSTEMS INC NAVY
275 CAMPBELL RD - STE 411
RICHARDSON, TX 75080
CONTRACT NUMBER:
MIKE FLOWER/R J MAYER
TITLE:
AVES ASSISTED MANUFACTURING PROCESS PLANNING (INTELLIGENT PLANNING ASSISTANT)
TOPIC# 150 OFFICE: NWSC/SSPO

THIS PHASE II EFFORT REPRESENTS A CONTINUANCE AND BROADING OF THE DEVELOPMENTAL INTEGRATION OF ARTIFICIAL INTELLIGENCE AND EXPERT SYSTEMS TECHNOLOGY INTO THE MACHINED METAL GOODS MANUFACTURING ENVIRONMENT. WITH THE GROWING INDUSTRY NEED FOR SYSTEMS WHICH CAN TAKE CAD DATA DIRECTLY AND MANIPULATE IT WITH MINIMAL HUMAN INTERVENTION, CIM SYSTEMS, INC. PROPOSES TO DEVELOP A SYSTEM WHICH CAN CREATE A SUITABLE MANUFACTURING PLAN INCLUDING NC PROGRAM GENERATION. THIS WOULD BE A DELIBERATE EXTENSION OF THE FEATURE DEFINITION DEVELOPED IN PHASE I USING CAD DATA FEATURE EXTRACTION, PLANNING RULE INTERACTION, NECESSARY DATABASE STRUCTURE, AND EXPERT SYSTEM SOFTWARE COMBINED WITH A CONVIENIENT OPERATOR INTERFACE SCHEME. EXTENSIVE MANUFACTURING ORIENTATION OF CIM SYSTEMS, INC. COORDINATED WITH THE EXPERIENCE AND FACILITIES OF THE KNOWLEDGE BASED SYSTEMS LABORATORY AT TEXAS A&M UNIVERSITY WILL BE UTILIZED TO DEVELOP THE NECESSARY SYSTEM, AND A SUITABLE "REAL WORLD ENVIRONMENT" BETA SITE WILL BE SELECTED TO PROVIDE THE CONCEPT OF AN "INTELLIGENT PLANNING ASSISTANT".

CKC INDUSTRIES INC NAVY
PO BOX 151012
TAMPA, FL 33684
CONTRACT NUMBER: N00039-88-C
CHARLES CHENG
TITLE:
POWER CONVERTER 110 VAC TO 8 VDC
TOPIC# 37 OFFICE: SPAWAR

PHASE I PROGRAM SUCCESSFULLY DEVELOPED THE PARAMETERS AND FEW SAMPLES

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FOR LIMITED TESTING. INTERNAL AND NAVY SYSTEM TESTING INDICATED POSITIVE AND FAVORABLE RESULTS. PHASE II EFFORT WILL BE IN PRODUCIBILITY AND FIELD TESTING AREA AS WELL AS ADDITIONAL FULL-BLOWN TESTS SUCH AS EMI ETC. A SUCCESSFUL PHASE II WILL LEAD INTO FULL PRODUCTION OF THIS DEVICE WHICH WILL SERVE THE NEED OF AN/PSC-2 DIGITAL COMMUNICATION TERMINAL.

CLEVELAND CRYSTALS INC AF
19306 REDWOOD AVE
CLEVELAND, OH 44110
CONTRACT NUMBER: F33615-87-C-1513
JACK HIETANEN
TITLE:
DEVELOPMENT OF LASER QUALITY AgGaSe2
TOPIC# 107 OFFICE: AFWAL/AA

THE FEASIBILITY OF PRODUCING OPTICAL QUALITY AgGaSe2 WAS ESTABLISHED UNDER A PHASE I PROGRAM. THE NEXT TASK OF FURTHER DEVELOPMENT WHICH WOULD LAY THE FOUNDATION OF A COMMERCIAL BUSINESS IS DESCRIBED IN THIS PROPOSAL. THE PHASE II PROGRAM WOULD HAVE AS ITS GOAL THE CONSISTENT PRODUCTION OF OPTICAL QUALITY CRYSTALS OF AgGaSe2 FROM WHICH FREQUENCY DOUBLERS AND OPO BARS COULD BE CUT HAVING DIMENSIONS OF AT LEAST 10 X 10 35mm, ABSORPTION/SCATTERING LOSSES LESS THAN 0.02cm(-1), AND DAMAGE THRESHOLD OF AT LEAST 50MW/cm(2). IDEALS TO IMPROVE THE PRESENT TECHNOLOGY INCLUDE THE USE OF STIRRING OF THE MELT DURING GROWTH, HEAT TREATING CRYSTALS IMMEDIATELY FOLLOWING GROWTH BEFORE COOL-DOWN, AND THE USE OF SHAPED GROWTH TUBES TO IMPROVE YIELD OF LONG BARS. TO DEMONSTRATE THE USEFULNESS OF CRYSTALS GROWN UNDER THIS PROGRAM, AN EFFICIENT OPTICAL PARAMETRIC OSCILLATOR WILL BE CONSTRUCTED AND OPTIMIZED FOR MAXIMUM PERFORMANCE. AN INTERNALLY FINANCED PILOT PRODUCTION OPERATION WILL COMMENCE AS SOON AS THE MAIN OBJECTIVES ARE ACHIEVED OR CLOSELY APPROACHED.

COHERENT TECHNOLOGIES INC AF
PO BOX 7488
BOULDER, CO 80306
CONTRACT NUMBER: F04701-87-C-0144
DR SAMMY W HENDERSON
TITLE:
EYESAFE SOLID-STATE COHERENT LIDAR SYSTEM FOR WIND AND WATER VAPOR MEASUREMENTS
TOPIC# 60 OFFICE: AFSTC/OLAB

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THE RESULTS OF THE PHASE I STUDY EFFORT HAVE INDICATED THE FEASIBILITY OF REMOTELY MEASURING BOTH WIND PROFILES AND THE VERTICAL DISTRIBUTION OF WATER VAPOR FROM A SPACE PLATFORM USING A COHERENT SOLID-STATE EYESAFE WIND AND DIFFERENTIAL ABSORPTION LIDAR (DIAL) SYSTEM. SOLID-STATE LASER TECHNOLOGY IS RAPIDLY ADVANCING AND IT IS NOW POSSIBLE TO DEVELOP AN EYESAFE (>1.4 um) COHERENT SOLID-STATE GROUND-BASED LIDAR SYSTEM TO DEMONSTRATE THIS COMBINED WIND AND WATER VAPOR MEASURING CAPABILITY. A COMPUTER SIMULATION OF THE COHERENT LIDAR, DIFFERENTIAL ABSORPTION, WATER VAPOR CONCENTRATION MEASURING PROCESS WAS UTILIZED TO DETERMINE THE FEASIBILITY OF GROUND- AND SPACE-BASED PERFORMANCE. INSTRUMENT AND ATMOSPHERIC EFFECTS ON MEASUREMENT PERFORMANCE WERE STUDIED. SEVERAL SOLID-STATE LASER MATERIALS WERE IDENTIFIED AND ONE RECOMMENDED FOR DEVELOPMENT. A GROUND-BASED, EYESAFE, SOLID-STATE, COHERENT WIND AND DIAL LIDAR SYSTEM IS SPECIFIED AND RECOMMENDED FOR DEVELOPMENT DURING THIS PHASE II EFFORT TO DEMONSTRATE THE TECHNOLOGY AND CONFIRM DESIGN PARAMETERS OF A COMBINED SPACE-BASED WIND AND WATER VAPOR MEASURING COHERENT LIDAR.

COLEMAN RESEARCH CORP SDIO
5950 LAKEHURST DR
ORLANDO, FL 32819
CONTRACT NUMBER:
JOEL GREENSTEIN
TITLE:
CONTROL OF A SPACE-BASED ELECTROMAGNETICALLY LAUNCHED PROJECTILE VIA A MODIFIED NUTATION DAMPER
TOPIC# 2 OFFICE:

A NOVEL TARGET SCANNING MECHANISMS IS BEING DEVELOPED FOR SPACE-BASED ELECTROMECHANICALLY-LAUNCHED PROJECTILE THAT EMPLOYS THE CONCEPT OF AN ACTIVE/PASSIVE MULTI-ELEMENT NUTATION DAMPER TO DECAY AND INDUCE NUTATION MOTION IN A PREDICTABLE AND CONTROLLABLE MANNER. A MATHEMATICAL MODEL OF A NUTATION DAMPER RESPONSE MECHANISM WAS CONCEPTUALIZED AND REFINED DURING AN EARLIER RESEARCH PHASE. THE FINAL VERSION OF THE COMPUTER MODEL CURRENTLY IS BEING DEVELOPED FOR INCORPORATION INTO A SIX DEGREE OF FREEDOM SIMULATION PROGRAM TO PREDICT THE COMPLETE SYSTEM (I.E., THE VEHICLE AND NUTATION DAMPER) DYNAMICS. ALL THE MATHEMATICAL FORMULATIONS AT A SUBSYSTEM LEVEL ARE BEING INTEGRATED TO ACHIEVE A SYSTEM LEVEL OR GLOBAL CONTROL LAW. A PROOF

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OF PRINCIPLE TEST IS BEING DESIGNED, FABRICATED, AND CONDUCTED AND THE RESULTS ANALYZED. WHEN SUCCESSFULLY DEMONSTRATED, THE RESULTANT SCANNER WILL HAVE A MINIMUM NUMBER OF MOVING PARTS AND, THEREFORE, MAXIMUM POSSIBLE RUGGEDNESS AND STRENGTH, EXTREME RELIABILITY, AND LOW LIFE-CYCLE COSTS. THERE ARE MANY DIFFERENT TYPES OF DEFENSE, SPACE, AND COMMERCIAL SCANNERS IN WHICH THE PROPOSED DEVICE MAY BE ADVANTAGEOUS INCLUDING: INFRARED, LASER, AND MILLIMETER WAVE SCANNERS/SEEKERS. DEFENSE APPLICATIONS INCLUDE ANY SPIN STABILIZED "SMART" MUNITION. MEDICAL APPLICATIONS INCLUDE CAT, IR, ULTRASONIC AND NMR SCANNERS.

COMDEL INC (OLD: MICROWAVE RADIO CORP) ARMY
BEVERLY AIRPOR - L P HENDERSON RD
BEVERLY, MA 01915
CONTRACT NUMBER:
THEODORE E JOHNSON
TITLE:
IMPROVED MICROWAVE COMMUNICATION SYSTEM FOR ROBOTIC VEHICLES
TOPIC# 113 OFFICE: TACOM/AMSTA

MICROWAVE RADIO CORPORATION PROPOSES TO DESIGN, DEVELOP, AND FURNISH A WORKING SYSTEM OF AN IMPROVED MICROWAVE COMMUNICATIONS SYSTEM. THIS SYSTEM IS DESIGNED TO PROVIDE A VIDEO LINK FROM MULTIPLE ROBOTIC VEHICLES. SPECIFIC ITEMS TO BE DEVELOPED ARE: A MICROWAVE ANTENNA SYSTEM, A MICROWAVE TRANSMITTER, A MICROWAVE RECEIVER.

COMMAND SYSTEMS GP INC ARMY
23430 HAWTHORNE BLVD - STE 150
TORRANCE, CA 90505
CONTRACT NUMBER:
MARVIN I MARTIN
TITLE:
RESEARCH IN AI FOR ON-BOARD MISSION/PAYLOAD MANAGEMENT
TOPIC# 61 OFFICE: CECOM/AMSEL

THE OBJECTIVES OF THE PHASE II PROGRAM ARE AS FOLLOWS: REWRITE IN THE ADA LANGUAGE ALL SORTIE PLAN ALGORITHMS, E.G., RESOURCE MANAGEMENT AND NAVIGATION WAYPOINT SELECTION, WHICH WOULD, INDEPENDENT OF HARDWARE, BE INCLUDED IN A GROUND BASED IEW/UAF MISSION PLANNING

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SYSTEM. IN DOING SO, EXTEND THE EO-ELINT MULTIPAYLOAD MISSION PLANNING CAPABILITY TO INCLUDE AN ESM/JAMMER OPTION. DEVELOP, IN THE ADA LANGUAGE, A VERSION OF THE NAVIGATION WAYPOINT SELECTION ALGORITHM AND SOFTWARE WHICH WOULD FACILITATE THE DEVELOPMENT OF A SELF-CONTAINED, STAND-ALONG AVIONICS PACKAGE FOR AUTONOMOUS IEW/UAV OPERATIONS. THE DESIRABILITY OF A STAND-ALONE AVIONICS PACKAGE IS THAT INDEPENDENT OF PAYLOAD MIX, IT WOULD SERVE AS A BRIDGE BETWEEN THE REQUIREMENTS OF MISSION/PAYLOAD OPERATIONS AND THE IEW/UAV AIR VEHICLE FLIGHT CONTROLLED. DEVELOP, IN THE ADA LANGUAGE, THE MEDFLI PAYLOAD SPECIFIC MISSION CONTROLLER ALGORITHMS REQUIRED TO ORIENT ANTENNAS, TIME RECEIVERS, AND INTERFACE WITH A CUE EITHER RADAR JAMMER OR ELECTRO-OPTICAL PAYLOAD OPERATIONS, DEPENDING UPON PAYLOAD MIX. IN SHORT, THE PHASE II PROGRAM, EXPEDITIED BY THE USE OF THE ADA LANGUAGE, WILL PRODUCE TRANSPORTABLE SOFTWARE WHICH WILL SUPPORT AUTONOMOUS, IEW/UAV MULTIPAYLOAD OPERATIONS VIA AN ON-BOARD ARCHITECTURE DEPICTED IN FIGURE 3-1. AS SHOWN, AN INITIAL AND/OR UPDATED MISSION PLAN WILL BE: 1) DEVELOPED IN THE GROUND-BASED, SORTIE PLAN RESOURCE MANAGEMENT AND NAVIGATION WAYPOINT SELECTION SYSTEM, AND 2) STORED IN THE IEW/UAV WHERE PLAN MODIFICATIONS WILL BE AUTOMATICALLY EFFECTED AS REQUIRED, DURING PERIODS OF AUTONOMOUS OR SEMI-AUTONOMOUS OPERATIONS.

COMMUNICATIONS & SYSTEMS SPECIALISTS INC NAVY
3901 NATIONAL DR - STE 280
BURTONSVILLE, MD 20866
CONTRACT NUMBER:
GEORGE MAHLER
TITLE:
THLL BASED SYMBOLIC DEBUG FACILITY FOR VAX/VMS
TOPIC# 104 OFFICE: NSWC/SSPO

THLL IS THE TRIDENT HIGHER LEVEL LANGUAGE WHICH IS USED FOR TRIDENT FIRE CONTROL PROGRAM DEVELOPMENT AND FOR SYSTEMS PROGRAMMING ON THE VAX. THE OVERALL OBJECTIVE OF THIS PHASE II SBIR IS TO DEVELOP A FACILITY WHICH WILL ALLOW A PROGRAMMER TO DEBUG THLL I AND THLL II PROGRAMS IN TERMS OF THLL CONSTRUCTS (I.E., SYMBOLICALLY) AND SOURCE LINE NUMBERS USING THE VAX/VMS SYMBOLIC DEBUGGER.

COMPUSEC INC AF
5333 MISSION CENTER RD - STE 100
SAN DIEGO, CA 92108
CONTRACT NUMBER: F19628-86-C-0203
MARGARET MURRAY
TITLE:
SECURE SOFTWARE SOURCE CODE VERIFICATION TOOLS: SOURCE-TO-FORMULA (STOF)
TOPIC# 46 OFFICE: ESD/XRCT

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COMPUSEC'S PHASE II GOAL IS TO CREATE A COMPREHENSIVE AUTOMATED SECURITY VERIFICATION ENVIRONMENT THAT OPERATES ON ADA SOURCE CODE INPUT. DURING PHASE II, THE FOLLOWING STOF VERIFICATION TOOLS WILL BE DESIGNED AND IMPLEMENTED IN ORDER TO CREATE AN AUTOMATED STOF SECURITY VERIFICATION ENVIRONMENT: ADA SECURITY ANALYZER; SECURITY GRAPH GENERATOR; VERIFICATION CONDITION GENERATOR (VCG); AND ENVIRONMENT SUPPORT TOOL. THESE TOOLS WILL OPERATE ON ADA SOURCE CODE INPUT AND WILL CREATE OUTPUR SUITABLE FOR SUBMISSION TO AN ACCEPTABLE THEOREM PROVER.

COMPUTATIONAL ENGINEERING SDIO
10210 GREENBELT RD - STE 440
SEABROOK, MD 20706
CONTRACT NUMBER:
DAVID W PORTER
TITLE:
DECENTRALIZED TRACKING/CORRELATION
TOPIC# 9 OFFICE:

TRACKING WITH A DECENTRALIZED SQUARE ROOT INFORMATION FILTER (SRIF) REPRESENTS A TECHNICAL BREAKTHROUGH THAT HOLDS THE POTENTIAL OF DRAMATICALLY RELAXING BALLISTIC MISSILE DEFENSE (BMD) SENSOR AND COMPUTER HARDWARE REQUIREMENTS. SINCE THE DECENTRALIZED SRIF DISTRIBUTES THE TRACKING CALCULATIONS TO LOCAL AND GLOBAL PROCESSORS WITH AN OPTIMAL STRUCTURE, SENSORS DO NOT HAVE TO BE OVERDESIGNED TO MAKE UP FOR THE INADEQUACIES OF APPROXIMATE SCHEMES THAT DISTRIBUTE TRACKING. THE FEASIBILITY WAS ESTABLISHED IN THE PREVIOUS RESEARCH PHASE OF DECENTRALIZED TRACKING USING A DECENTRALIZED SRIF. A MULTIRATE DECENTRALIZED SRIF WAS DEVELOPED. A NUMERICAL SIMULATION WAS PERFORMED TO COMPARE THE MULTI-RATE DECENTRALIZED CONVARIANCE FILTER TRACKER WITH THE SRIF TRACKER. A HIGH FIDELITY MODEL FOR SELECTED BMD CONFIGURATIONS AND OPERATIONAL CONDITIONS IS BEING DEVELOPED TO FOCUS FURTHER THEORETICAL DEVELOPMENT. A NUMERICAL STUDY QUANTITATIVELY DEMONSTRATING PERFORMANCE IS BEING PERFORMED AND AN ALGORITHM FOR PARALLEL PROCESSING IS BEING DEVELOPED.

COMPUTATIONAL MECHANICS CO INC AF
4804 AVE H
AUSTIN, TX 78751
CONTRACT NUMBER: F29601-87-C-0066
DR JON M BASS
TITLE:
ADAPTIVE COMPUTATIONAL METHODS FOR CHEMICALLY REACTIVE RADIATIVE FLOWS
TOPIC# 86 OFFICE: AFWL/PRC

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PHASE II OF THIS PROJECT IS TO INVOLVE THE DEVELOPMENT OF FULLY ADAPTIVE PROCEDURES FOR THE ANALYSIS OF TWO-AND THREE-DIMENSIONAL CHEMICALLY REACTING FLOWS, WITH EMPHASIS ON THOSE FLOWS AND CHEMICAL KINETICS OF INTEREST IN CHEMICAL LASER ANALYSIS AND DESIGN. THE METHODOLOGIES AND CODES PRODUCED ARE TO HAVE THE CAPABILITY OF PRODUCING ESTIMATES OF THE COMPUTATIONAL ERROR, OR PROVIDING PLOTS OF ERROR RESIDUALS OF EACH FLOW/CHEMISTRY COMPONENT VARIABLE, AND IN ADJUSTING THE CALCULATION TO REDUCE ERRORS TO PREASSIGNED LIMITS. THE WORK IS TO REPRESENT A GENERALIZATION, AN EXTENSION, AND ASSIMULATION OF THE COMPONENTS OF PHASE I INTO A UNIQUE COMPUTATIONAL TOOL FOR THE ANALYSIS OF VERY COMPLEX TWO- AND THREE-DIMENSIONAL CHEMICALLY REACTING FLOWS. THE ADAPTIVE PROCEDURES ARE TO INCLUDE MOVING MESH, MESH REFINEMENT, SPECTRAL-TYPE METHODS, AND COMBINED METHODS OF ADAPTIVITY. SCHEMES FOR HANDLING THE CLASSICAL PROBLEM OF COMPUTING VARIABLES WITH WIDELY VARYING SCALES SHALL BE SPECIFICALLY ADDRESSED IN THE INVESTIGATION. THE PHASE II EFFORT SHOULD PRODUCE THE WORKING COMPONENT (SUBROUTINES, ALGORITHMS, PRE- AND POST-PROCESSORS) OF A FULLY ADAPTIVE VECTORIZED CODE AND TWO- AND THREE-DIMENSIONAL PROBLEMS FOR ARBITRARY GEOMETRIES AND GENERAL BOUNDARY CONDITIONS WHICH CAN PRODUCE OPTIMAL OR QUASI-OPTIMAL SOLUTIONS FOR A WIDE RANGE OF FLOW PROBLEMS.

COMPUTER ALGORITHM DEV/OLD: SHULTZ R E) AF
4520- VE H
AUSTIN, TX 78751
CONTRACT NUMBER:
RICHARD E SHULTZ
TITLE:
SIX DEGREE OF FREEDOM OBJECT RECOGNITION
TOPIC# 213 OFFICE: BMO/MYSC

PROJECT GOAL IS TO MAKE THE SIX DEGREE OF FREEDOM LOCAL FEATURE FOCUS OBJECT RECOGNITION ALGORITHM (6DFLFF) WORK FROM REAL IMAGES. THIS ALGORITHM HAS THE POTENTIAL TO EXCEED IN CAPABILITY AND SPEED ALL EXISTING OBJECT RECOGNITION PROGRAMS. A VERSION THAT WORKS FROM LINES ONLY WAS SHOWN TO WORK FROM SIMULATED IMAGES IN PHASE I. THE FIRST STEP WILL BE TO BUILD AN OBJECT RECOGNITION DEVELOPMENT SYSTEM THAT CAPTURES A VIDEO IMAGE OF THE OBJECT AND CONVERTS THAT IMAGE TO A LIST OF THE FEW HUNDRED MOST NOTICEABLE LINES. NEXT, THE VERSION FROM PHASE I WILL BE MODIFIED AS NECESSARY TO FIND THE

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OBJECT IN A REAL LINE IMAGE. LAST STEP WILL BE TO WRITE A VERSION CAPABLE OF FINDING THE OBJECT FROM A LIST OF LINES AND CURVES.

CONSULTANT'S CHOICE INC ARMY
8800 ROSWELL RD - STE 130
ATLANTA, GA 30350
CONTRACT NUMBER:
PAUL D LAMPRU JR
TITLE:
RESEARCH AND DEVELOPMENT TO SUPPORT ENVIRONMENTAL EFFECTS ANALYSIS AND AUTOMATED FORECASTING ON THE AIRLAND BATTLEFIELD
TOPIC# 74 OFFICE: LABCOM/ASL

THE WIDE DISPERSION OF U.S. ARMY FORCES ON THE MODERN BATTLEFIELD AND THE COMPLEXITY OF CURRENT WEAPON SYSTEMS HAVE INCREASED THE REQUIREMENTS FOR AUTOMATED WEATHER EFFECTS ANALYSIS. IN ORDER FOR A WEATHER ANALYST TO EVALUATE THE EFFECTS OF WEATHER ON MILITARY OPERATIONS, WEATHER EVENTS MUST BE REGISTERED AND SCALED TO A MAP BACKGROUND. THEREFORE, THE OVERALL GOAL OF THIS R&D PROPOSAL IS TO INTEGRATE AND TO EVOLVE THE EXISTING SET OF TWI MODELS INTO A MORE SOPHISTICATED SET OF PROGRAMS CAPABLE OF AUTOMATING WEATHER EFFECTS ANALYSIS AND DISPLAY. IN ADDITION, THIS PROPOSAL INCLUDES WORK TO DESIGN, TEST, EVALUATE, AND DETERMINE THE POTENTIAL OF ARTIFICIAL NEURAL SYSTEMS TO SUPPORT AUTOMATED METEOROLOGICAL FORECASTING WITHIN THE AUTOMATED WEATHER EFFECTS ANALYSIS SYSTEM.

CORDEC CORP AF
8270-B CINDER BED RD
LORTON, VA 22079
CONTRACT NUMBER: F33615-88-C-5403
DR RAYMOND J WEIMER
TITLE:
FABRICATION OF THIN-WALLED SEAMLESS TUBES FROM GRAPHITE/MAGNESIUM PRECURSOR TAPES
TOPIC# 157 OFFICE: AFWAL/ML

THE PHASE I EFFORT SUCCESSFULLY DEMONSTRATED THE FEASIBILITY OF FABRICATING THIN-WALLED SEAMLESS TUBES FROM CONTINUOUS GRAPHITE/ MAGNESIUM METAL MATRIX COMPOSITE (MMC) PRECURSOR TAPES. CORE TECH-

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NOLOGIES WERE DEVELOPED FOR (1) PRODUCING MMC PROCURSORS BY VAPOR DEPOSITION OF AZ31B MAGNESIUM ALLOY ONTO ULTRA-HIGH MODULUS P100 CARBON FIBERS, (2) CONSOLIDATING UNIDIRECTIONAL, ORTHOTROPIC, AND QUASI-ISOTROPIC THIN-SHEET MMC"S BY HOT-PRESSING/DIFFUSION-BONDING, AND (3) PULTRUDING THIN-WALLED MMC TUBES. TENSILE STRENGTH OF 88 ksi AND YOUNG'S MODULUS OF 56 Msi WERE MEASURED IN UNIDIRECTIONAL PANELS. ONE-INCH DIAMETER, 12-INCH LONG, MMC TUBES WERE PULTRUDED WITH 0.022-INCH WALL THICKNESS. WITH OVER 50 VOLUME PRECENT FIBERS, THESE P100/AZ31B TUBES ARE SUITABLE FOR ZERO-CTE APPLICATIONS. PHASE II WILL FOCUS ON CRITICAL QUALITY AND REPRODUCIBILLITY ISSUES IDENTIFIED IN PHASE I, NAMELY, MMC PRECURSOR TAPE UNIFORMITY, OPTIMIZATION AND STANDARDIZATION OF CONSOLIDATION PRACTICES IN HOT PRESSING AND PULTRUSION, AND INITIATION OF AN ENGINEERING PROPERTY DATA BASE TO PROVIDE DESIGNERS WITH RELIABLE MECHANICAL PROPERTIES, THERMAL EXPANSION, AND CONDUCTIVITY DATA. THIS APPROACH WILL QUICKLY PROVIDE AEROSPACE STRUCTURAL DESIGNERS WITH A HIGH-PERFORMANCE GRAPHITE/ MAGNESIUM MMC HAVING THE REQUIRED HIGH SPECIFIC MODULUS AND DIMENSIONAL STABILITY.

CORIOLIS CORP AF
15315 SOBEY RD
SARATOGA, CA 95070
CONTRACT NUMBER: F33615-87-C-5325
ARTHUR H IVERSEN
TITLE:
HIGH POWER MICROFOCUS X-RAY FOR REAL TIME AND COMPUTERIZED INSPECTION
TOPIC# 159 OFFICE: AFWAL/ML

THE CONSTRUCTION OF A NEW CLASS OF LIQUID COOLED, CONTINUOUS DUTY ROTATING ANODE X-RAY TUBES FOR NDI IS PROPOSED. THIS NEW HIGH AVERAGE POWER X-RAY CAN BE EXPECTED TO HAVE AN OUTPUT POWER AN ORDER OF MAGNITUDE OR GREATER THAN CURRENTLY USED FIXED ANODE X-RAY TUBES. IN GENERAL, THIS POWER INCREASE TRANSLATES DIRECTLY INTO ABOUT A 10 X INCREASE IN SYSTEM THROUGHPUT FOR COMPUTERIZED AND FILM INSPEC-TION TECHNIQUES, AND SUPERIOR IMAGES (INCREASED COUNTING STATISTICS FOR IMPROVED CONTRAST) FOR REAL TIME BLADE OR MOTOR INSPECTION SYS-TEMS. THIS PHASE II PROGRAM WILL DESIGN, DEVELOP AND DEMONSTRATE AN EXPERIMENTAL LIQUID COOLED ROTATING ANODE X-RAY CAPABLE OF OPERATING AT 4,000 WATTS, 0.3mm FOCAL SPOT UNDER SIMULATED NDI CONDITIONS

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WHILE PROVIDING A MINIMUM OF 500 HOURS LIFE. THE HIGH VOLTAGE ELECTRON GUN DESIGN METHODS DEVELOPED IN THE PHASE I PROGRAM WILL BE INCORPORATED INTO THE PHASE II ELECTRON GUN. TO DATE, 6 PATENTS (INCLUDING ONE EUROPEAN) HAVE ISSUED OR BEEN ALLOWED COVERING THE TECHNOLOGY OF THIS NEW X-RAY TUBE.

CREARE INC SDIO
PO BOX 71 - ETNA RD
HANOVER, NH 03755
CONTRACT NUMBER:
DR PAUL H ROTHE
TITLE:
MATERIALS DEVELOPMENT FOR PULSED CONDUCTORS
TOPIC# 2 OFFICE:

ADVANCED MATERIALS AND FABRICATION METHODS NEED TO BE DEVELOPED FOR APPLICATION IN THE RAILS OF ELECTROMAGNETIC LAUNCHERS THAT ARE CAPABLE OF SUSTAINED, HIGH RATE FIRING WITH HIGH MUZZLE ENERGY. IN PREVIOUS RESEARCH, MATERIALS CHARACTERISTICS NECESSARY TO ACHIEVE THESE, MISSION GOALS WERE DEFINED. A CONCEPT FOR CRYOGENICALLY COOLED TRANSPOSED ELECTRICAL CONDUCTORS WAS IDENTIFIED THAT PROMISES PAYOFFS OF LOW ENERGY LOSS AND REDUCED THERMAL MANAGEMENT REQUIREMENTS. THESE CONCEPTS ARE BEING FURTHER DEVELOPED THROUGH ANALYTICAL MODELING AND EXPERIMENTATION. THE PERFORMANCE OF THE CONDUCTOR IS BEING DEMONSTRATED IN A RAILGUN FIRING AT HIGH CURRENT. A TRANSPOSED CONDUCTOR TEST SPECIMEN FOR AN ELECTROMAGNETIC GUN RAIL IS BEING FABRICATED. STRATEGIC AND TACTICAL DEFENSE APPLICATIONS ARE IN ADVANCED KINETIC ENERGY WEAPONS THAT HAVE EXTREMELY CHALLENGING REQUIREMENTS FOR POWER, FIRING RATE, COMPACTNESS, AND LOW MASS IN ORBIT FOR SPACE-BASED SYSTEMS. BROADER APPLICATIONS MAY BE FOUND IN COMMERCIAL ELECTROMAGNETIC LAUNCHERS, AND IN HIGH POWER PULSED CONDUCTORS OF VARIOUS KINDS.

CREARE INC SDIO
PO BOX 71 - ETNA RD
HANOVER, NH 03755
CONTRACT NUMBER:
DR HERBERT SIXSMITH
TITLE:
WEST TURBOEXPANDER FOR CRYOCOOLERS OF SPACEBORNE SURVEILLANCE SENSORS
TOPIC# 3 OFFICE:

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ADVANCED MATERIALS AND FABRICATION METHODS NEED TO BE DEVELOPED FOR APPLICATION IN THE RAILS OF ELECTROMAGNETIC LAUNCHERS THAT ARE CAPABLE OF SUSTAINED, HIGH RATE FIRING WITH HIGH MUZZLE ENERGY. IN PREVIOUS RESEARCH, MATERIALS CHARACTERISTICS NECESSARY TO ACHIEVE THESE MISSION GOALS WERE DEFINED. A CONCEPT FOR CRYOGENICALLY COOLED TRANSPOSED ELECTRICAL CONDUCTORS WAS IDENTIFIED THAT PROMISES PAYOFFS OF LOW ENERGY LOSS AND REDUCED THERMAL MANAGEMENT REQUIREMENTS. THESE CONCEPTS ARE BEING FURTHER DEVELOPED THROUGH ANALYTICAL MODELING AND EXPERIMENTATION. THE PERFORMANCE OF THE CONDUCTOR IS BEING DEMONSTRATED IN A RAILGUN FIRING AT HIGH CURRENT. A TRANSPOSED CONDUCTOR TEST SPECIMEN FOR AN ELECTROMAGNETIC GUN RAIL IS BEING FABRICATED. STATEGIC AND TACTICAL DEFENSE APPLICATIONS ARE IN ADVANCED KINETIC ENERGY WEAPONS THAT HAVE EXTREMELY CHALLENGING REQUIREMENTS FOR POWER, FIRING RATE, COMPACTNESS, AND LOW MASS IN ORBIT FOR SPACE-BASED SYSTEMS. BROADER APPLICATIONS MAY BE FOUND IN COMMERCIAL ELECTROMAGNETIC LAUNCHERS, AND IN HIGH POWER PULSED CONDUCTORS OF VARIOUS KINDS.

CREATIVE OPTICS INC ARMY
32 WILDWOOD DR
BEDFORD, MA 01730
CONTRACT NUMBER:
DR JOHN F EBERSOLE
TITLE:
A NOVEL TECHNIQUE FOR SMART SENSOR TESTING AND EVALUATION
TOPIC# 160 OFFICE: TECOM

WE HAVE ACHIEVED IMPORTANT ADVANCES IN TWO MAJOR AREAS:
(a) DEMONSTRATION OF A NEW METHODOLOGY FOR CHARACTERIZING BACKGROUNDS TO HELP DETERMINE SMART SENSOR TARGET DETECTION PROBABILITIES, PERMITTING EXTRAPOLATION OF FIELD TEST RESULTS TO MANY BACKGROUNDS, AND (b) DEMONSTRATION OF THE UTILITY OF A NEW TECHNOLOGY FOR USE BY TEST OFFICERS TO DESIGN, CONDUCT, AND ANALYZE FIELD TRIALS IN ORDER TO EVALUATE--IN REAL TIME--SMART SENSOR PERFORMANCE.

CRIMMINS A G NAVY
1503 ABERDEEN CT
LANSDALE, PA 19446
CONTRACT NUMBER:
ARTHUR G CRIMMINS
TITLE:
KEYBOARD SYSTEM FOR DATA ENTRY
TOPIC# 94 OFFICE: NSWC/SSPO

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QDIP UTILIZES THE FULL RANGE OF TACTILE, AUDIBLE AND VISUAL TEACHING SYSTEMS TO TEACH CHORDIC COMMANDS IN A TEN KEY HANDGRIP SYSTEM TO ALLOW FOR RAPID AND INSTINCTIVE DATA INPUT FOR WEAPON CONTROL SYSTEM. THE PHASE II EFFORT WILL APPLY THE QDIP CONCEPT TO THE GUN FIRE CONTROL SYSTEM, MK 86 MODS 3, 4, AND 5 BY PROVIDING A GRAPHIC COMPUTER DISPLAY OF THE EXISTING EP2 CONTROL CONSOLE AND ALLOWING THE OPERATOR TO SELECT THE FUNCTION OR INPUT DATA AS REQUIRED TO OPERATE THE SYSTEM THROUGH THE HANDGRIP KEY SYSTEM OF QUIP. A MAJOR GOAL OF THE PHASE II PROGRAM WILL BE THE TRAINING OF SELECTED INDIVIDUALS ON THE QDIP SYSTEM AND EVALUATION OF THIS TRAINING AGAINST THE STANDARD METHODS USED FOR THE SELECTED FIRE CONTROL SYSTEM. THE QUIP SYSTEM PERMITS THE TRAINING OF INDIVIDUALS CLASSIFIED AS FUNCTIONAL ILLITERATES AND THIS PREMISE WILL BE TESTED BY TRAINING AS SELECTED INDIVIDUAL TO OPERATE THE SELECTED FIRE CONTROL SYSTEM WITHOUT THE USE OF THE WRITTEN WORD; ONLY TACTILE AND AUDIBLE COMMANDS WILL BE USED IN THIS AREA OF THE TRAINING PROGRAM.

CRITES ENTERPRISES AF
PO BOX 13651
ST LOUIS, MO 63138
CONTRACT NUMBER:
ROGER C CRITES
TITLE:
THIN FILM ELECTRET BOUNDARY LAYER TRANSITION DETECTOR
TOPIC# 292 OFFICE: AEDC/DOT

A RESEARCH PROGRAM IS PROPOSED TO DEVELOP AN ECONOMICAL NON-INTRUSIVE BOUNDARY LAYER TRANSITION DETECTOR. THE NEW DETECTOR IS A THIN (0.001 TO 0.003 INCH) PLASTIC FILM WITH A LARGE IMBEDDED ARRAY OF MINIATURE FLUCTUATING PRESSURE TRANSDUCERS. BONDED TO THE AERODYNAMIC SURFACE OF INTEREST, THE DETECTOR YIELDS A DETAILED MAP OF FLUCTUATING SURFACE PRESSURE. TURBULENT BURSTS IN THE TRANSITIONAL REGION RESULT IN A CHARACTERISTIC PEAK IN LOCAL SURFACE PRESSURE FLUCTUATION. TRANSITION IS LOCATED BY RESOLVING THIS PEAK.

CSI INC (COMPUTER SCIENCE INNOVATIONS) AF
1280 CLEARMONT ST NE
PALM BAY, FL 32905
CONTRACT NUMBER: F19628-86-C-0146
ROBERT J WHITE
TITLE:
ADAPTIVE NULLING BY ELECTRICAL SURFACE CONTROL OF A REFLECTOR ANTENNA
TOPIC# 53 OFFICE: RADC/DOR

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PHASE I OF THIS PROJECT HAS SHOWN THAT IT IS FEASIBLE AND DESIRABLE TO FORM NULLS USING REFLECTIVE ELEMENTS MOUNTED ON THE SURFACE OF CONVENTIONAL REFLECTOR ANTENNAS. PHASE II CONTINUES THE DEVELOPMENT. THE REFLECTIVE ELEMENTS ARE TYPICALLY (THOUGH NOT NECESSARILY) GROUPED INTO CLUSTERS ON THE REFLECTOR SURFACE. THE REFLECTIVE PHASE OF EACH ELEMENT IS CONTROLLABLE SO THAT THE TOTAL SECONDARY FIELD OF THE ANTENNA IS CONTROLLABLE. SINGLE AND MULTIPLE NULLS CAN BE FORMED RAPIDLY. THE CLUSTERS CAN BE ADDED TO EXISTING OR NEW ANTENNAS AT CONSIDERABLY LESS COST AND BETTER PERFORMANCE (LESS LOSS) THAN PHASED ARRAYS. EXTENDED APPLICATIONS IN ADDITION TO NULL STEERING INCLUDE SURFACE DISTORTION CORRECTION, RAPID BEAM STEERING, AUTOTRACKING, BEAM SHAPING, AND LOW RADAR CROSS SECTION ANTENNAS. PHASE I HAS SHOWN FEASIBILITY THROUGH ANALYSIS AND SIMULATIONS. PHASE II PROVIDES THE PERFORMANCE BOUNDS THROUGH ANALYSIS AND EXPERIMENTS.

DAMASKOS INC ARMY
PO BOX 469
CONCORDVILLE, PA 19331
CONTRACT NUMBER:
WILLIAM J BITER
TITLE:
MICROWAVE TRASPARENT CONTROLLED EMISSIVITY FILMS
TOPIC# 96 OFFICE: BRDEC

DAMASKOS, INC. PROPOSES TO CONTINUE DEVELOPMENT AND FABRICATION OF A THIN FILM COATING SYSTEM INTENDED TO LOWER THE IR SIGNATURE OF AN OBJECT. THIS WILL BE ENGINEERED FOR THE DESIRED OPTICAL PROPERTIES, SPECIFICALLY, CONTROLLED EMISSIVITY VALUES IN THE INFRARED SPECTRUM FROM 8 TO 12 MICRONS AND WILL BE INTEGRATED INTO A COMPLETE STRUCTURE WHICH WILL ALSO SERVE AS A RADAR ABSORBER. THIS STRUCTURE WILL BE FABRICATED AND TESTED DURING THIS PHASE II PROGRAM. THIN FILM TECHNIQUES WHICH ARE CAPABLE OF LARGE AREA DEPOSITION AT REASONABLE COST WILL BE USED TO MAKE THE COATING SYSTEM.

DEACON RESEARCH SDIO
900 WELCH RD - STE 203
PALO ALTO, CA 94304
CONTRACT NUMBER:
DAVID A G DEACON
TITLE:
ULTRA-VIOLET DAMAGE TO OPTICAL MATERIALS
TOPIC# 1 OFFICE:

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THE PRINCIPAL BEAM EXTRACTION OPTICS IN DEFENSE APPLICATION MUST WITHSTAND BALLISTIC MISSILE FREE ELECTRON LASERS (FEL) INTENSITY DESPITE THE PRESENCE OF A HIGH PARASITIC FLUX OF ULTRAVIOLET (UV) RADIATION WHICH IS KNOWN TO DAMAGE OPTICAL MATERIALS. UNDERSTANDING OF THE BASIS PROCESSES WHICH RESULT IN UV DAMAGE MAY ALLOW THE DEVELOPMENT OF DAMAGE RESISTANT OPTICAL SYSTEMS SUCH AS CHANGING MATERIALS, COATING FABRICATING TECHNIQUES, OR SURFACE HEALING TECHNIQUES. UNDER A PREVIOUS RESEARCH EFFORT, THE SURFACE DIAGNOSTICS WERE INVESTIGATED THAT MIGHT BE APPLICABLE TO THIS PROBLEM, AND TWO WERE SELECTED THAT APPEAR TO BE APPROPRIATE (XPS AND TOF SPECTROSCOPY FOR THE PHOTOEMITTED IONS). AN EXPOSURE CHAMBER FOR THE SAMPLE HAS BEEN DESIGNED THAT MAKES PROVISION FOR MOUNTING THESE DIAGNOSTICS SO THAT MEASURES CAN PROCEED DURING UV EXPOSURE. IN THE CURRENT EFFORT, THE EXPOSURE CHAMBER IS BEING BUILT AND OPERATED. BOTH METALLIC AND THE DIELECTRIC COATINGS ARE BEING EXAMINED. CHANGES IN THE SURFACED CHEMISTRY ARE BEING MEASURED THAT APPEAR TO CAUSE THE INCREASE ABSORPTION AND CORRELATED WITH THE UV PHOTON ENERGY AND FLUENCE. THE MECHANISM(S) WHICH GIVES RISE TO THESE CHANGES ARE BEING INVESTIGATED WITH THE AID OF THE PHOTO-STIMULATED ION DESORPTION SPECTRUM. THIS RESEARCH, WHEN SUCCESSFULLY DEMONSTRATED, WOULD RESULT IN THE DEVELOPMENT OF UV-HARD COATINGS FOR USE IN THE FEL OR OF A DEVICE TO DECARBONIZE THE COATINGS WHICH LEAVES THE OPTICAL QUALITY INTACT.

DECISION SCIENCE CONSORTIUM INC ARMY
7700 LEESBURG PIKE - STE 421
FALLS CHURCH, VA 22043
CONTRACT NUMBER:
JACOB W ULVILA
TITLE:
SPECIFYING TESTING AND EVALUATING C3I SYSTEMS THAT EMPLOY ARTIFICIAL INTELLIGENCE
TOPIC# 161 OFFICE: TECOM/EPG

THE OBJECTIVE OF THIS PROPOSED RESEARCH IS TO DEVELOP NEW METHODS OF TESTING AND EVALUATION THAT ARE APPROPRIATED FOR C3I SYSTEMS THAT EMPLOY ARTIFICIAL INTELLIGENCE (AI). BUILDING ON THE RESULTS OF PHASE I, WHERE WE RECOMMENDED SOFTWARE STANDARDS FOR COMMON LISP, DEVELOPED OTHER STATIC AND DYNAMIC TEST FEATURES, ADAPTED MULTI-ATTRIBUTE UTILITY ANALYSIS FOR AI SOFTWARE TESTING, AND DEVELOPED A SOFTWARE PROTOTYPE, WE WILL CONDUCT PHASE II ACCORDING TO THE

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FOLLOWING TASKS. IN TASK 1, WE WILL COMPLETE THE MATHEMATICAL DEVELOPMENT OF OBJECTIVE MEASURES OF ACCURACY AND BIAS IN AI SYSTEMS. IN TASK 2, WE WILL COMPLETE THE DEVELOPMENT OF JUDGMENTAL PERFORMANCE MEASURES AND DEVELOP APPROPRIATE TEST INSTRUMENTS. IN TASK 3, WE WILL PROTOTYPE THE METHODS DEVELOPED IN OTHER TASKS. IN TASK 4, WE WILL IMPLEMENT THE METHOD IN A TEST ADVISORY SYSTEM. IN TASK 5, IF ALTERNATIVE 1 IS SELECTED, WE WILL RECOMMEND SOFTWARE DESIGN AND CODING STANDARDS FOR AN AI SHELL. IN TASK 6, IF ALTERNATIVE 1 IS SELECTED, WE WILL EXPLORE APPLICATIONS OF THE METHODS BEYOND C3I SYSTEMS TO TEST AI SYSTEMS IN GENERAL. IN TASK 7, IF ALTERNATIVE 2 IS SELECTED, WE WILL BUILD A SOFTWARE INSPECTOR FOR COMMON LISP. IN PHASE III, WE WILL PURSUE COMMERCIALIZATION OF THE PHASE II PRODUCTS.

DECISION SCIENCE CONSORTIUM INC ARMY
7700 LEESBURG PIKE - STE 421
FALLS CHURCH, VA 22043
CONTRACT NUMBER:
DR MARVIN S COHEN
TITLE:
ARTIFICIAL INTELLIGENCE FOR COMMAND AND CONTROL
TOPIC# 50 OFFICE: CECOM/AMSEL

THE COMPLEXITY OF THE MODERN BATTLEFIELD ENVIRONMENT IS RAPIDLY OUTSTRIPPING THE CAPABILITIES OF TRADITIONAL GREASE PENCIL AND ACETATE TECHNOLOGY. AUTOMATED DECISION AIDS ARE BECOMING ESSENTIAL IN AN ENVIRONMENT WHERE HIGH STAKES DECISIONS MUST BE MADE UNDER TIME STRESS WITH INFORMATION THAT IS INCOMPLETE, UNCERTAIN, AND OFTEN CONFLICTING. SYSTEMS ARE NEEDED WHICH COMPLEMENT THE STRENGTH AND COUNTERBALANCE THE WEAKNESSES OF HUMAN DECISION MAKERS. THERE IS A PARTICULAR NEED FOR INTEGRATING A THEORETICALLY SOUND INFERENCE CALCULUS WITH MECHANISMS ARE REQUIRED TO ALLOW THE SYSTEM TO TAKE INPUTS AND PRODUCT OUTPUTS IN A FORM THAT IS NATURAL TO USERS. THIS IS FACILITATED BY AN ASSUMPTION-BASED REASONING PROCESS AKIN TO THAT USED BY HUMAN DECISION MAKERS, AND BY A NUMERICAL INPUTS. PHASE I RESEARCH HAS RESULTED IN THE DEVELOPMENT OF A THEORETICAL STRUCTURE FOR DEVELOPMENT OF AN ADAPTIVE INFERENCE CAPABILITY FOR OPERATIONAL PLANNING AIDS. THREE TASK AREAS ARE PROPOSED FOR PHASE II EXTENSION OF THIS WORK: (1) DEVELOP DESIGN CONCEPTS FOR A SYSTEM TO AID THE SITUATION ASSESSMENT PROCESS; (2) DEVELOP DESIGN CONCEPTS FOR A SYSTEM TO AID THE COURSE OF ACTION GENERATION AND EVALUATION PROCESS;

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AND (3) BUILD A DEMONSTRATION SYSTEM IMPLEMENTING THE DESIGN CONCEPTS FOR SITUATION ASSESSMENT.

DECISION-SCIENCE APPLICATIONS INC AF
1901 N MOORE ST - STE 1000
ARLINGTON, VA 22209
CONTRACT NUMBER:
DR ARTHUR J BRUCKHEIM
TITLE:
SAR-AIDED BGV GUIDANCE
TOPIC# 220 OFFICE: BMO/MYSC

THERE IS A CONCERN THAT AN UNAIDED INERTIAL NAVIGATION SYSTEM (INS) FOR THE BOOST GLIDE VEHICLE (BGV) MAY NOT PRODUCE THE ACCURACITES REQUIRED FOR MANY PLANNED BGV APPLICATIONS. ONE POTENTIAL SOLUTION TO THE GUIDANCE ACCURACY PROBLEM IS TO USE SYNTHETIC APERTURE RADAR (SAR) TO PROVIDE IMPROVED GUIDANCE. FOR SAR-AIDED INS, THE SAR FORMS AN IMAGE OF THE GROUND. BY COMPARING THE SAR-GENERATED IMAGE WITH A PRE-STORED IMAGE, A MAP MATCHING ALGORITHM EXTRACTS MEASUREMENTS (SUCH AS RANGE AND RANGE-RATE) OF THE SAR RELATIVE TO THE PRESTORED LOCATION OF THE CENTER OF THE IMAGE. THE BGV GUIDANCE SYSTEM COMBINES THE SAR/MAP MATCHER MEASUREMENTS, AND MEASUREMENTS FROM THE INS TO UPDATE THE GUIDANCE. DSA PROPOSES TO STUDY SAR-AIDED INS FOR THE BGV BY ACCURATELY MODELING THE APPROPRIATE ELEMENTS OF THE TOTAL SYSTEM; THE INS, THE SAR, THE MAP MATCHER, AND THE KALMAN FILTER. IN ADDITION, DSA PROPOSES TO STUDY THE EFFECTS OF PLASMA AND CONSIDER THE APPLICATIONS OF SAR FOR TERMINAL HOMING.

DEFENSE ELECTROMAGNETIC ANALYSIS CO ARMY
5 MORAINE CT
CHAMPAIGN, IL 61821
CONTRACT NUMBER:
DR SHUNG-WU LEE
TITLE:
STUDY OF ANTENNA RADOME MADE OF FREQUENCY SELECTIVE SURFACE
TOPIC# 105 OFFICE: MICOM

A FREQUENCY SELECTIVE SURFACE (FSS) IS MADE OF A PERIODIC ARRAY OF METAL APERTURES OR PLATES, SANDWICHED BETWEEN DIELECTRIC SLABS.

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RADOMES MADE OF FSS MAY BE BETTER THAN THE CONVENTIONAL RADOMES IN TERMS OF ELECTROMAGNETIC TRANSMITTIVITY AND MECHANICAL STRENGTH. THE PRESENT PROJECT WILL STUDY THE SUITABILITY OF FSS RADOMES FOR ARMY'S MISSILE APPLICATIONS, AND TO DEVELOP A COMPUTER CODE FOR ANALYZING THEM.

DESIGN CIRCUITS INC NAVY
18 KENDRICK RD
WAREHAM, MA 02571
CONTRACT NUMBER:
DON R DeSANTIS
TITLE:
DIRECT ATTACHMENT OF INTEGRATED CIRCUITS TO PRINTED CIRCUIT BOARDS
TOPIC# 149 OFFICE: NWSC

THIS PROJECT PROPOSES TO DEVELOP THE CHIP-ON-BOARD TECHNOLOGY, WHEREIN INTEGRATED CIRCUIT CHIPS ARE ATTACHED TO PRINTED CIRCUIT SUBSTRATES WITH THERMAL AND ELECTRICAL PROPERTIES THAT WILL PERMIT CHIP SURVIVAL. THE WORK PLAN WILL INCLUDE A MORE EXTENSIVE SURVEY OF THE CURRENT TECHNOLOGY, BOTH DOMESTIC AND ABROAD, THERMAL MANAGEMENT AND ENVIRONMENTAL PROTECTION STUDIES, SURVEY OF SUBSTRATE MATERIALS, BUILDING FUNCTIONAL CIRCUITS, AND STRESS AND RELIABILITY TESTING AND ANALYSIS. UPON COMPLETING THE DEVELOPMENT OF THIS TECHNOLOGY, A SMALL PRODUCTION LINE WILL BE SET UP TO BEGIN COMMERCIAL APPLICATION OF THE TECHNOLOGY.

DIAGNOSTIC SPECIALTIES INC ARMY
PO BOX 4338 - 4 LEONARD ST
METUCHEN, NJ 08840
CONTRACT NUMBER:
DR RINALDO PAGNUCCO
TITLE:
A NOVEL ROUTINE ASSAY FOR AIDS VIRUS AND OTHER PATHOGENIC VIRUSES
TOPIC# 210 OFFICE: MEDICAL

PHASE I EFFORTS SHOWED THE FEASIBILITY OF A DUAL PROBE FLUORESCENT ASSAY FOR AIDS DNA FRAGMENTS. REAGENTS, INSTRUMENTS AND PROCEDURES WILL BE DEVELOPED FOR THE ROUTINE SCREENING OF BLOOD SAMPLES FOR HIV,

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THE CAUSATIVE VIRUS FOR AIDS. THE ASSAY WILL DIRECTLY DETECT THE VIRUS, IN CONTRAST TO THE CURRENTLY UTILIZED ASSAYS IN WHICH THE INDIVIDUAL'S ANTIBODY RESPONSE TO THE VIRUS IS MEASURED. THE NEW APPROACH IS DESIGNATED A "DUAL PROBE CONTACT ASSAY." IN THIS ASSAY, A POSITIVE RESPONSE WILL BE ELICITED ONLY WHEN A PAIR OF DIFFERENT DNA PROBES COME IN CONTACT. THIS CONTACT WILL OCCUR ONLY ON THE DESIGNATED TARGET (HIV) DNA. THE RESPONSE ELICITED ON CONTACT WILL BE A FLUORESCENT SIGNAL. TWO CONVENIENT METHODS OF DETECTING THIS FLUORESCENCE WILL BE EXPLORED - AN IMMUNOASSAY TIME DECAY FLUOROMETER (AVAILABLE COMMERCIALLY) AND A POLAROID CAMERA WITH APPROPRIATE LIGHT SOURCE. A 3-DIMENSIONAL MOLECULAR DESIGN STUDY WILL BE UNDERTAKEN IN ORDER TO FACILITATE THE CHOICE OF CHEMICALLY SYNTHESIZED PROBES TO BE PREPARED. THE RESULTING PROBES WILL BE TESTED WITH THE TARGET DNA FOR EFFICACY. THE PROBES WILL BE ALTERED AS NEEDED TO PRODUCE A RESPONSE ONLY WITH THE DESIRED TARGET. IN THE SECOND YEAR OF THE PROJECT IMPLEMENTATION INTO A PRACTICAL ASSAY WILL BE ACCOMPLISHED. THE ASSAY WILL BE OPTIMIZED USING TARGET, SYNTHETIC NUCLEIC ACID ADDED TO NORMAL BLOOD. ONE OR BOTH OF THE ABOVE MENTIONED DETECTION SYSTEMS WILL BE USED ALONG WITH REAGENT AND PROTOCOLS IN A CLINICAL LABORATORY FOR EVALUATION OF BLOOD SAMPLES FOR HIV. COMMERCIALIZATION WILL BE UNDERTAKEN IN PHASE III.

DIALOG SYSTEMS INC NAVY
2842 E GRAND RIVER
EAST LANSING, MI 48823
CONTRACT NUMBER:
DR OMAR K HELFERICH
TITLE:
RULE BASE EXPERT SYSTEM FOR RETAIL INVENTORY ITEM MANAGEMENT
TOPIC# 78 OFFICE: NAVSUP

THE COMPLETE PHASE II EFFORT IS DESIGNED TO RESULT IN AN EXPERT SYSTEMS BASED DECISION SUPPORT SYSTEM FOR COMMODITY MANAGERS (CM'S) BEING INSTALLED AT NSC PENSACOLA. IN ADDITION, ONE OPTION IN THE PHASE II PROPOSAL ALLOWS FOR INSTALLATION OF AN OPERATIONAL TEST SYSTEM AT NSC NORFOLK. THE PROPOSAL ENVISIONS A FOLLOW-ON EFFORT TO PHASE II FOR DEPLOYMENT OF THE FULL FUNCTION SYSTEM AT ALL NAVY SUPPLY CENTERS. THE SYSTEM CONSISTS OF A RETAIL INVENTORY MANAGEMENT OPERATING ENVIRONMENT AND AN EXPERT SYSTEM BASED DECISION SUPPORT SYSTEM. THE OPERATING ENVIRONMENT CONSISTS OF MAINFRAME AND PC HARD-

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WARE, SOFTWARE FOR COMMUNICATIONS OF DATA AND DECISION OUTPUT, AND INTERFACES FOR CM INPUT. THE SYSTEM WILL BE INTEGRATED WITH EXISTING MAINFRAME DATA BASES FOR DOWNLOAD OF VARIOUS INFORMATION AND WILL ALLOW FOR EXPORT OF DECISION OUTPUT TO MAINFRAME DATA BSSES AND COMMUNICATION CHANNELS. THE OPERATING ENVIRONMENT WILL ALSO PROVIDE AN EXPERT SYSTEMS BASED MEANS FOR PRIORITIZATION OF CM WORKLOADS AND A MEANS FOR KNOWLEDGE BASE ENHANCEMENT ON AN ONGOING BASIS. THE EXPERT SYSTEM BASED DECISION SUPPORT SYSTEM ITSELF WILL PROVIDE OPERATIONAL ASSISTANCE TO CM'S IN THE AREAS OF DUES MANAGEMENT, REPLENISHMENT PROCESSING, RANGE MAINTENANCE, DEMAND DEVIATION ANALYSIS, AND MISR MAINTENANCE. THE COMPLETE PHASE II EFFORT CONSISTS OF FIVE TASKS WITH TASK 2 TO 5 STRUCTURED AS OPTIONS TO BE COMMITTED TO AT A LATER DATE IF THE NAVY DECIDES TO PROCEED. TASK 1 CONSISTS OF AN OPERATIONAL TEST OF THE OPERATING ENVIRONMENT AND DUES MANAGEMENT DECISION SUPPORT MODULE. THIS TEST IS TO BE COMPLETED AT NSC PENSACOLA. TASK 2 CONISTS OF A REPEAT OF THE TEST AT NSC NORFOLK. TASK 3 PROVIDES FOR ASSISTANCE IN TRANSFERRING AI TECHNOLOGY TO NAVSUP COMPONENTS. TASK 4 PROVIDES FOR DEVELOPMENT OF ADDITIONAL DECISION SUPPORT MODULES BEYOND DUES MANAGEMENT WHILE TASK 5 ALLOWS FOR DEVELOPMENT OF ANY REMAINING MODULES NECESSARY FOR A FULL FUNCTION SYSTEM. THE PROPOSAL ENVISIONS A FOLLOW-ON EFFORT TO PHASE II FOR PURPOSES OF DEVELOPING A DEPLOYMENT PACKAGE AND DEPLOYING THE SYSTEM AT ALL OF THE NAVY SUPPLY CENTERS.

DIGITAL OPTICS INC SDIO
800 W UNIVERSITY - STE C
ROCHESTER, MI 48063
CONTRACT NUMBER:
RAYMOND ARRATHOON
TITLE:
OPTICAL ASSOCIATIVE SUPERPROCESSOR
TOPIC# 9 OFFICE:

A VERY FEW ALGORITHMS OF ANY COMPLEXITY CAN BE IMPLEMENTED IN COMBINATIONAL LOGIC BECAUSE OF INTERCONNECTION LIMITATIONS LINKED TO THE RESTRICTIONS OF THE INDIVIDUAL SWITCHING ELEMENTS. IN AN EARLIER PHASE OF THIS RESEARCH, A NEW TECHNOLOGY BASED ON FIBER OPTIC PROGRAMMABLE LOGIC ARRAYS (OPLAs) WAS DEVELOPED, AND A WORKING PROTOTYPE OF A RUDIMENTARY OPTOELECTRONIC CENTRAL PROCESSING UNIT CONSTRUCTED. THE DEVICE ACHIEVED A HIGH FAN-IN/FAN-OUT FACTOR AND DEMONSTRATED THE

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ABILITY OF OPTOELECTRONIC LOGIC TO IMPLEMENT RELATIVELY COMPLEX NEAREST NEIGHBOR ALGORITHMS IN A FULLY PARALLEL MODE, A CAPABILITY IM-PUTATIONAL MACHINE. THE SECOND IS TO EXAMINE THE ABILITY TO THE PORTANT IN EDGE DETECTION FOIL IMAGE PROCESSING. RESEARCH CURRENTLY UNDERWAY IS DEMONSTRATING THAT OPTOELECTRONIC COMBINATIONAL LOGIC PROVIDES A MECHANISM FOR IMPLEMENTING VARIOUS COMPLEX IMAGE PROCESSING ALGORITHMS IN A FULLY PARALLEL MODE. TWO SEPARATE FIBER OLPAs ARE BEING CONSTRUCTED THAT ARE CAPABLE OF EXECUTING ENTIRE IMAGE PRO-CESSING ALGORITHMS IN COMBINATIONAL LOGIC. THE FIRST IS EXPECTED TO EFFECT A SOBEL GRADIENT EDGE PICTURE OPERATION, AND THE SECOND A SKELETON ALGORITHM. THE FAN-IN-FAN-OUT CAPABILITIES OF FIBER OPTIC BASED LOGIC ARRAYS ARE BEING DEMONSTRATED. WHEN SUCCESSFULLY DEMONSTRATED, THIS APPROACH IS LIKELY TO LEAD TO AN INCREASE IN COMPUTATIONAL THROUGHPUT AND AN IMPROVEMENT IN SOFTWARE RELIABILITY IN A VARIETY OF APPLICATIONS.

DIGITAL OPTICS INC DARPA
620 UNIVERSITY DR
ROCHESTER, MI 48063
CONTRACT NUMBER:
RAYMOND ARRATHOON
TITLE:
RECONFIGURABLE OPTICAL SWITCH
TOPIC# 13 OFFICE: DARPA

THE OBJECT OF THE PHASE II PROGRAM IS TO CONSTRUCT A FIBER OPTIC BASED OPTOELECTRONIC LOGIC ARRAY THAT IS FUNCTIONALLY EQUIVALENT TO A THIRTY-TWO BY THIRTY-TWO NONCONTENDING CROSSBAR SWITCH. THE ARRAY IS TO OPERATE AT A DATA RATE OF 10 MEGABITS PER SECOND AND IS TO BE CAPABLE OF ACHIEVING A RECONFIGURATION RATE OF 10 MHz. THIS APPROACH ELIMINATES THE NEED FOR A SPATIAL LIGHT MODULATOR.

DIGITAL RADIO CORP ARMY
601 S PACIFIC COAST HWY
REDONDO BEACH, CA 90277
CONTRACT NUMBER:
COREY ENG
TITLE:
ADAPTABLE JAMMER
TOPIC# 55 OFFICE: CECOM/AMSEL

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ECM SYSTEMS CAPABLE OF AGILE MOVEMENTS AS HIGH AS 20 MEGA-STEPS (50 nsec MOVEMENT BETWEEN ANY TWO FREQUENCIES) AND WAVEFORM RANGING FROM WIDEBAND FM NOISE, SSB, AM, FSK, TO PULSED ON ARE REALIZEABLE WITH TODAYS OFF-THE-SHELF TECHNOLOGY. THE PHASE I STUDY RESULTS INDICATES TWO APPROACHES TO REDUCING THE WIDE RANGE OF POWER AMPLIFIER TYPES REQUIRED FOR ECM SYSTEMS CAPABLE OF GENERATING A FULL LIBRARY OF WAVEFORMS AND AGILE FREQUENCY MOVEMENT STRATEGIES. THE FIRST APPROACH IS TO DEVELOP A RECONFIGURABLE POWER AMPLIFIER SWITCHABLE TO CLASS A, B, C, D, E, ETC., USING HIGH POWER SWITCHING DEVICES. THE SECOND APPROACH IS TO DEVELOP A PROGRAMMABLE EXCITER CAPABLE OF GENERATING ANY WAVEFORM IN A CONSTANT ENVELOPE FORMAT THUS REQUIRING ONLY ONE POWER AMPLIFIER TYPE. DUE TO ITS SIMPLICITY AND REDUCED AMPLIFIER REQUIREMENTS, THE SECOND APPROACH WAS SELECTED AS THE SUBJECT OF THIS PROPOSAL FOR FURTHER ADVANCED DEVELOPMENT.

DIGITAL VIDEO PROCESSING INC ARMY
7841 EPSILON DR
ROCKVILLE, MD 20855
CONTRACT NUMBER:
MATTHEW PRICE
TITLE:
A CMOS ARRAY PROCESSOR BASED ON THE TMS320
TOPIC# 183 OFFICE: TECOM/CSTA

THE TMS320 PROCESSOR FAMILY, FROM TEXAS INSTRUMENTS, INCLUDES SEVERAL HIGH PERFORMANCE CMOS MICROPROCESSORS SUITED TO LOW-POWER DIGITAL SIGNAL PROCESSING (DSP) APPLICATIONS. DVP INC., HAS DEMONSTRATED THE FEASIBILITY OF APPLYING THE TECHNOLOGY THAT THESE CHIPS HAVE PROVIDED TO AN INNOVATIVE DATA ACQUISITION SYSTEM BUILT AROUND NATIONAL SEMICONDUCTOR'S CIMBUS (CMOS INDUSTRIAL MICROCOMPUTER BUS). THE TMS320 PROCESSORS CAN EFFICIENTLY IMPLEMENT FFTs (FAST FOURIER TRANSFORMS), DIGITAL FILTERS, MATH FUNCTIONS, AND OTHER COMPUTATIONALLY INTENSIVE ALGORITHMS NEEDED FOR REAL-TIME SIGNAL PROCESSING. TWO TMS320 DSP BOARDS, WHICH FILL AN IMPORTANT NEED EXISTING IN BOTH THE COMMERCIAL SECTOR AND THE UNITED STATES GOVERNMENT, HAVE BEEN DESIGNED FOR THE CIMBUS. THE DVP DESIGN HAS BEEN MADE EXTREMELY FLEXIBLE BY USING FIRMWARE ROUTINES IN APPROPRIATE SECTIONS OF THE HARDWARE CIRCUITRY. THIS DESIGN PRACTICE WILL ENSURE A BROAD RANGE OF APPLICABILITY AND GREATLY INCREASE THE PRODUCT'S LONGEVITY. IN ADDITION, AS PART OF THE PHASE I WORK EFFORT,

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SEVERAL PROGRAMS HAVE BEEN DEVELOPED TO IMPLEMENT RESIDENT SIGNAL PROCESSING FUNCTIONS. THESE BOARDS WILL HAVE CAPABIITIES THAT NO OTHER EXISTING CIMBUS BOARDS CAN FULFILL. THE PHASE II INTENT OF THIS UNIQUE DESIGN PROJECT IS TO FABRICATE AND TEST THESE BOARDS AND THEIR ASSOCIATED SOFTWARE.

DWA COMPOSITE SPECIALTIES INC NAVY
21119 SUPERIOR ST
CHATSWORTH, CA 91311
CONTRACT NUMBER:
MICHAEL A WEBB
TITLE:
DEVELOPMENT AND DEMONSTRATION OF TAILORED MMC'S AS PASSIVE THERMAL MANAGEMENT OPTIONS FOR ADVANCED NAVY SYSTEMS COMPONENTS
TOPIC# 55 OFFICE: NAVSEA

THE OUTSTANDING TAILORABILITY OF GRAPHITE REINFORCED METAL PROPERTIES WAS DEMONSTRATED IN THE PHASE I EFFORT. THIS PHASE II EFFORT EXTENDS AND APPLIED THE RESEARCH AND ANALYSIS ON TAILORED MMC MATERIALS EMPHAZING INNOVATIVE PASSIVE THERMAL MANAGEMENT SOLUTIONS FOR NAVAL AVIONICS/ELECTRONICS AND GUIDANCE ITEMS, INCLUDING CONTAINMENT AND PACKAGING WHERE HEAT REMOVAL AND CTE CONTROL ARE PRIMARY NECESSITIES. THE PROGRAM FOCUS WILL BE ON IDENTIFYING SPECIFIC SYSTEM/COMPONENT REQUIREMENTS, TAILORING MMC PROPERTIES TO FIT THE SPECIFIC REQUIREMENTS, FABRICATING TEST COMPONENTS, DEMONSTRATING PERFORMANCE PAYOFFS, AND ASSESSING FABRICABILITY, RELIABILITY, REPRODUCIBILITY AND COST FACTORS. THE OVERALL OBJECTIVE IS TO TRANSITION THESE UNIQUE SOLUTIONS INTO PRODUCTION USAGE IN THE EARLIEST TIME FRAME AS WELL AS TO PROVIDE A DESIGN DATA BASE FOR FUTURE APPLICATIONS.

DWA COMPOSITE SPECIALTIES INC NAVY
21119 SUPERIOR ST
CHATSWORTH, CA 91311
CONTRACT NUMBER:
MARK R VAN DEN BERGH
TITLE:
HYBRID MMC COMPOSITES COMBINING THERMAL CONDUCTIVITY/DISTORTION CONTROL AND STRUCTURAL STABILITY FOR ADVANCED AIRFRAME APPLICA
TOPIC# 56 OFFICE: NAVSEA

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THIS PHASE II PROGRAM EXTENDS AND APPLIED THE RESEARCH AND ANALYSIS ON HYBRID METAL-MATRIX COMPOSITES (MMC) MATERIAL SYSTEMS FOR USE IN NAVY STRUCTURES WHERE THERMAL CONDUCTIVITY, HIGH THERMAL DISTORTION LOADS, AND STRUCTURAL EFFICIENCY ALL MUST BE ACCOMMODATED. THE PROGRAM IS DESIGNED TO DEVELOP VARIOUS USE-TEMPERATURE HYBRID COMPOSITES FOR AT LEAST TWO MATRIX METALS, AND WILL INITIALLY CONSIDER SEVERAL REINFORCEMENTS. A PRELIMINARY DATABASE FOR THESE COMPOSITES WILL BE GENERATED BY CHARACTERIZING THEIR MECHANICAL PROPERTIES, THERMAL CHARACTERISTICS, MICROSTRUCTURE, AND HIGH-TEMPERATURE CAPABILITY. A SERIES OF NAVY AIRFRAME AND MISSILE STRUCTURES (SUCH AS STANDARD MISSILE, BLOCK IV) WILL BE EVALUATED FOR MATERIAL REQUIREMENTS AND DESIGN CRITERIA; SELECTED AIRFRAME STRUCTURES OR SUBELEMENTS WILL BE PRODUCED. AT PROGRAM END, A FINAL REPORT WILL BE PREPARED WHICH WILL SUMMARIZE PROGRAM RESULTS (AND OTHER GOVERNMENT AGENCY APPLICATION OPPORTUNITIES) FOR THE SELECTED HIGH-TEMPERATURE MMC SYSTEMS.

DYNA EAST CORP AF
3201 ARCH ST - 3RD FL
PHILADELPHIA, PA 19104
CONTRACT NUMBER: 88-23011
MICHAEL G CRILLY
TITLE:
BI-METALLIC SELF FORGING FRAGMENT WARHEAD FOR ENHANCED BEHIND-ARMOR EFFECTS
TOPIC# 27 OFFICE: AFATL/MNW

THE LETHALITY OF ANY DIRECTED-ENERGY WARHEAD IS MEASURED BY ITS ABILITY TO CAUSE IRREPARABLE DAMAGE TO THE VULNERABLE COMPONENTS THAT EXIST BEHIND THE PROTECTIVE ARMOR. THIS DAMAGE IS INCURRED BY THE IMPACT OF THESE COMPONENTS BY EITHER THE PENETRATOR MATERIAL OR BY THE TARGET SPALL MATERIAL GENERATED BY THE INTERACTION BETWEEN THE PENETRATOR AND ARMOR. SIGNIFICANT IMPROVEMENT IN LETHALITY CAN BE ACHIEVED BY THE INCLUSION OF A PYROPHORIC OR INCENDIARY MATERIAL IN THE ATTACKING PENETRATOR. THIS PYROPHORIC/INCENDIARY MATERIAL HAS BEEN SHOWN TO PRODUCE BOTH AN OVERPRESSURE AND THERMAL PULSE WITHIN AN ENCLOSED VEHICLE. THE INCLUSION OF SUCH "ENERGETIC" MATERIAL IN A "FOLLOW-THROUGH" SELF-FORGING FRAGMENT (SFF) PENETRATOR HAS BEEN SUCCESSFULLY DEMONSTRATED BY AFATL AND DYNA EAST. SINCE THE FINAL BI-METALLIC SFF DESIGN WILL BE INCORPORATED INTO A LONG-STANDOFF (120 CD) WEAPON SYSTEM (I.E., SENSOR FUSED WEAPON), THE SLUG MUST BE

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AEROSTABLE OVER A MUCH LONGER RANGE THAN DEMONSTRATED IN THE PHASE I EFFORT. DURING THE PHASE II EFFORT WE PROPOSE TO ADDRESS THE DESIGN OF A LONG-STANDOFF, AEROSTABLE COPPER/ALUMINUM SFF PENETRATOR, WHILE MAINTAINING (OR EXCEEDING) THE PENETRATION PERFORMANCE AND QUANTITY OF ENCAPSULATED ENERGETIC MATERIAL PREVIOUSLY DEMONSTRATED.

DYNA EAST CORP AF
3201 ARCH ST
PHILADELPHIA, PA 19104
CONTRACT NUMBER: 88-23010
RICHARD M WEST
TITLE:
DESIGN AND APPLICATION OF NOVEL SHAPED CHARGE WARHEADS
TOPIC# 27 OFFICE: AFATL/MNW

IN THE PHASE I PROGRAM THE JET INFORMATION PROCESS WAS STUDIED, A SHAPED CHARGE WAS DESIGNED, AND A SIGNIFICANT IMPROVEMENT IN PERFORMANCE AGAINST AN ADVANCED ARMOR TARGET WAS DEMONSTRATED. FURTHER PERFORMANCE GAINS WOULD BE POSSIBLE WITH IMPROVED UNDERSTANDING THE FORMATION PROCESS.

DYNAMET TECHNOLOGY INC NAVY
EIGHT A ST
BURLINGTON, MA 01803
CONTRACT NUMBER:
STANLEY ABKOWITZ
TITLE:
MANUFACTURING/MATERIAL OPTIMIZATION--PRODUCTION CAPABILITY OF ECONOMICALLY ADVANTAGEOUS TITANIUM P/M THIN WALL PRESSURE VESSELS
TOPIC# 148 OFFICE: NWSC/SSPO

THE APPLICATION OF NEAR NET SHAPE TITANIUM POWDER METAL TECHNIQUES FOR THE MANUFACTURE OF THIN WALLED PRESSURE VESSELS CAN LEAD TO A SUBSTANTIAL COST REDUCTION WHEN ELEMENTAL TITANIUM AND MASTER ALLOY POWDERS ARE UTILIZED AS RAW MATERIALS. THIS CONCEPT FEASIBILITY WAS PROVEN IN THE PHASE I EFFORT FOR A SUBSCALE D-5 PBCS. IN PHASE II, AFTER FURTHER MATERIAL AND PROCESS OPTIMIZATION, THIS MANUFACTURING TECHNOLOGY WHICH DEPENDS ON COLD ISOSTATIC PRESSING FOLLOWED BY SINTER AND HIPING, WILL BE APPLIED TO THE MANUFACTURE OF FULLSIZE

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TITANIUM 6-C-4 TEST MOTOR PROTOTYPES. THESE PROTOTYPES WILL BE EVALUATED NON-DESTRUCTIVELY, PROOF AND BURST TESTED AND TEST FIRED. IN ADDITION, THE COST EFFECTIVENESS OF THIS MANUFACTURING TECHNOLOGY WILL BE FIRMLY ESTABLISHED. DYNAMET TECHNOLOGY, INC. WILL FABRICATE THE PROTOTYPES AND CONDUCT MECHANICAL PROPERTY AND METALLOGRAPHIC EVALUATIONS. ATLANTIC RESEARCH CORPORATION WILL COLLABORATE ON DESIGN, CONDUCT NON-DESTRUCTIVE EVALUATIONS, PROOF AND BURST PRESSURE TESTS AND PERFORM TEST FIRINGS. THIS ARC EFFORT WILL BE UNDERTAKEN AT NO COST TO THE GOVERNMENT. CONSULTING MEMBERS OF THE DEVELOPMENT TEAM WILL CONTRIBUTE FINITE ELEMENT DESIGN AND ANALYSIS, COST ASSESSMENT AND SPECIALIZED METALLOGRAPHIC TECHNIQUES AS REQUIRED TO EXECUTE THE PROPOSED PROGRAM. IN ADDITION TO THE TECHNICAL STUDIES AND EVALUATION TESTS, A DEMONSTRATION P/M PREFORM AND A FINISHED MACHINED COMPONENT WILL BE SUPPLIED TO THE NAVY WEAPONS SUPPORT CENTER.

E-TEK DYNAMICS INC AF
250 EAST DR
MELBOURNE, FL 32904
CONTRACT NUMBER: F33615-87-C-1517
J J PAN
TITLE:
FIBER DISTRIBUTION NETWORK
TOPIC# 109 OFFICE: AFWAL/AA

PHASED-ARRAY ANTENNA, C(3)I, RADAR, SENSOR ARRAY, OPTICAL SIGNAL PROCESSING, AND LOCAL AREA NETWORK SYSTEMS DEMAND HIGH PERFORMANCE FIBER DISTRIBUTION COUPLERS. NO SINGLE-MODE 1XN (N > 2) FIBER COUPLER OR FABRICATION METHOD IS CURRENTLY AVAILABLE, WHICH SLOWS THE GROWTH OF USING FIBER OPTICS IN THESE SYSTEMS. E-TEK PROPOSED AN INNOVATIVE 1XN COUPLER USING GRADED-INDEX (GRIN) LENS FOR EITHER SINGLE-MODE OR MULTIMODE FIBER DISTRIBUTION NETWORK. IN ADDITION TO THE PROPOSED THEORETICAL INVESTIGATIONS, 1X12 AND 1X38 GRIN LENS COUPLERS HAVE BEEN DESIGNED, FABRICATED, AND TESTED DURING PHASE I R&D TO DEMONSTRATE FEASIBILITY AND VIABILITY. THE TEST RESULTS INDICATE THAT THE NEW COUPLERS HAVE LOW EXCESS LOSS AND LESS THAN + OR - 1 dB LOSS DEVIATION. IN PHASE II, E-TEK WOULD REFINE THE COUPLER DESIGN AND IMPROVE PERFORMANCE. 1X100 SINGLE-MODE AND 1XN (200 < OR - N , OR - 1,000) MULTIMODE DISTRIBUTION COUPLERS WILL BE FABRICATED AND PACKAGED FOR PRACTICAL SYSTEM APPLICATIONS. MANY OTHER R&D TASKS

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INCLUDING SEMIAUTOMATIC SETUPS FOR FIBER ETCHING, FIBER CLEAVING, DIMENSION MEASUREMENT, AND COUPLER TESTING ARE RECOMMENDED FOR PHASE II.

ECODYNAMICS RESEARCH ASSOCS INC AF
PO BOX 8172
ALBUQUERQUE, NM 87198
CONTRACT NUMBER: F29601-87-C-0055
DR PATRICK J ROACHE
TITLE:
ADAPTIVE GRIDS FOR RAVEN
TOPIC# 86 OFFICE: AFWL/PRC

THIS PROPOSAL IS FOR THE INCORPORATION OF ADAPTIVE GRID NUMERICAL METHODS AND OTHER ALGORITHMIC AND STRUCTURAL IMPROVEMENTS INTO AN EXISTING TIME DEPENDENT THREE DIMENSIONAL NAVIER-STOKES COMPUTER MODEL, THE RAVEN CODE. THE FINAL CODE, RAVEN II, WILL INCLUDE THE FOLLOWING FEATURES: EXPLICIT SECOND ORDER FLUID DYNAMICS ALGORITHMS, INCLUDING FCT; OPTIONS FOR LOCAL TIME STEPPING AND IMPLICIT CHEMISTRY; AUTOMATIC ERROR ESTIMATION; REDUCTION OF ARRAY STORAGE RETENTION OF 1D ELEMENT IDENTIFIERS, WITH MAPPING TO LOGICALLY CARTESIAN DATA STRUCTURES; HYBRID VARIATIONAL ADAPTIVE GRID GENERATION ALGORITHM; CODE OPTIMIZATION PRIMARILY FOCUSED ON FINE-SCALE PARALLELISM AND PAGING OPERATIONS FOR THE CRAV 2; FORMATION OF A SMALL USER GROUP TO EVALUATE RAVEN II; SIMPLIFIED USER INTERFACE UTILIZING A PORTABLE NAMALIST TECHNIQUE FOR ALL INPUT VARIABLES; REDUCTION OF PROBLEM SETUP TIME; FORMAL MANAGEMENT OF THE CODE DEVELOPMENT AND MAINTENANCE; AND EXTENSION OF THE "UPDATE" STRUCTURE TO ALL MODULES. THE COMBINATION OF THE ADAPTIVE GRID GENERATION, ADVANCED FLUID DYNAMIC ALGORITHMS, AND AUTOMATIC ERROR ESTIMATION, ALL TAILORED TO SUPERCOMPUTER ARCHITECTURE, HAS TREMENDOUS POTENTIAL FOR IMPROVING THE EFFICIENCY, EASE OF USE, ROBUSTNESS, AND ACCURACCY OF SOLUTIONS.

EIC LABS INC SDIO
111 DOWNEY ST
NORWOOD, MA 02062
CONTRACT NUMBER:
R DAVID RAUH
TITLE:
NICKEL OXIDE/HYDROGEN MULTILAYER BIPOLAR BATTERY DEVELOPMENT FOR PULSED POWER
TOPIC# 5 OFFICE:

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SPACE-BASED MISSILE DEFENSE SYSTEMS WILL REQUIRE SOURCES OF PULSED POWER TO OPERATE PROSPECTIVE DIRECTED ENERGY WEAPONS. POWER MUST BE AVAILABLE INSTANTANEOUSLY AND SEQUENTIAL POWER PULSES MUST HAVE MINIMAL INTERPULSE DELAYS. IN PRINCIPLE, AN ELECTROCHEMICAL POWER SOURCE CAN PROVIDE POWER AT A MUCH LOWER WEIGHT THAN ALTERNATIVE MAGNETIC OR ELECTRIC FIELD DEVICES (CAPACITORS OR INDUCTORS). HOWEVER, ADVANCES MUST BE MADE IN HIGH RATE THIN FILM ELECTRODE MATERIALS AND BATTERY DESIGN. IN A PREVIOUS PHASE OF THE RESEARCH, THE FEASIBILITY WAS DEMONSTRATED OF DEVELOPING A HIGHLY REVERSIBLE NICKEL OXIDE/METAL HYDRIDE BATTERY COUPLED FOR THE HIGH PULSE POWER OPERATION. UNDER THE CURRENT RESEARCH, THE RATE LIMITING PROCESSES ARE BEING IDENTIFIED AND LAYER ELECTRODE MATERIALS AND ELECTRODE STRUCTURE FOR HIGH RATE OPTIMIZED. THIS INCLUDES DEVELOPMENT OF HYDRATED NICKEL OXIDE CATHODES DOPED FOR OPTIMUM IONIC AND ELECTRONIC CONDUCTIVITY AND MULTICOMPONENT NICKEL BASED ALLOY ANODES WITH HIGH HYDROGEN TRANSPORT RATE AND OPTIMIZED SURFACE CATALYSIS. BATTERY PERFORMANCE IS BEING DEMONSTRATED IN LABORATORY PROTOTYPES. WHEN SUCCESSFULLY DEMONSTRATED, IT IS ANTICIPATED THAT THE ELECTRODES WILL BE CAPABLE OF >100 SEQUENTIAL PULSES OF 1 ms DURATION, BEFORE CHANGE, EACH PULSE WITH A POWER DENSITY OF >1000 W/cm sq. FULL MULTILAYER BIPOLAR BATTERIES OF 10E5 W/kg PULSE OR GREATER COULD BE CONSTRUCTED BASED ON THE PERFORMANCE.

EIC LABS INC NAVY
111 DOWNEY ST
NORWOOD, MA 02062
CONTRACT NUMBER:
K M ABRAHAM
TITLE:
PREPARATION AND DEVELOPMENT OF ADVANCED BATTERY CATALYSIS
TOPIC# 114 OFFICE: NSWC/SSPO

A PROGRAM TO DEVELOP ADVANCED BATTERY CATALYSTS IS PROPOSED. A FIRM FOUNDATION FOR THIS PHASE II STUDY HAS BEEN LAID IN PHASE I WITH THE DEVELOPMENT OF NEW CATALYSTS EXHIBITING SIGNIFICANTLY IMPROVED CATALYTIC ACTIVITY IN Li/SOCl(2) CELLS. ADDITIONAL CATALYST CANDIDATES WILL BE INVESTIGATED IN PHASE II. DETAILED STUDIES ARE PROPOSED TO ELUCIDATE THE MECHANISM OF CATALYSIS IN THE Li/SOCl(2) CELL. DESIGN AND DEVELOPMENT OF ADVANCED Li BATTERIES UTILIZING THE IMPROVED CATALYSTS ARE PROPOSED. THE ENERGY DENSITY OF THE

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BATTERY WILL BE FURTHER INCREASED WITH THE USE OF SOCl(2)/SO(2)Cl(2) MIXED ELECTROLYTES.

EIC LABS INC ARMY
111 DOWNEY ST
NORWOOD, MA 02062
CONTRACT NUMBER:
JOSEPH S FOOS
TITLE:
ELECTROLYTE ADDITIVES FOR RECHARGEABLE LITHIUM BATTERIES
TOPIC# 77 OFFICE: LABCOM/ETDL

A COMPREHENSIVE RESEARCH AND DEVELOPMENT EFFORT TO STUDY THE EFFECT OF UNSATURATED HETEROCYCLIC ORGANIC COMPOUNDS SUCH AS 2,METHYL-FURAN ON THE CYCLING EFFICIENCY OF THE Li ELECTRODE IN MIXED ETHER ELECTROLYTES IS PROPOSED. AN IMPROVED ELECTROLYTE COMPOSITION IN TERMS OF Li CYCLING EFFICIENCY AND LOW TEMPERATURE DISCHARGE PERFORMANCE WILL BE DETERMINED FROM A PARAMETRIC STUDY INVOLVING FOUR MIXED ETHER ELECTROLYTES AND FOUR ADDITIVES. THE FOUR MIXED ETHER ELECTROLYTES ARE LiAsF6 SOLUTIONS IN TETRAHYDROFURAN/2,METHYL-TETRAHYDROFURAN, TETRAHYDROFURAN/2,METHYL-TETRAHYDROFURAN/DIOXOLAN, TETRAHYDROFURAN/2, METHYL-TETRAHYDROFURAN/4,METHYL DIOXOLANE AND TETRAHYDROFURAN/2, METHYL-FURAN, 2, METHYL-THIOPHENE, FURAN AND THIOPHENE. THE MECHANISMS OF THE EFFECT OF ADDITIVES WILL BE STUDIED BY CHEMICAL AND SPECTROSCOPIC ANALYSIS OF CYCLED CELLS AND ELECTROCHEMICAL EXPERIMENTS IN SPECIAL LABORATORY CELLS.

EIC LABS INC NAVY
111 DOWNEY ST
NORWOOD, MA 02062
CONTRACT NUMBER:
K M ABRAHAM
TITLE:
STUDIES OF THE FUNDAMENTALS OF SOLID STATE BATTERIES
TOPIC# 8 OFFICE: ONR

THE CONTRACTOR WILL OPTIMIZE THE DIMENSIONAL STABILITY OF THE ELECTROLYTE (POLY (BIS-(METHOXYETHOXYETHOXIDE)) PHOSPHAZINE BY BLENDING IT WITH POLY(ETHYLENE OXIDE) AND SUPPORTING IT ON POROUS

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FIBERGLASS PAPER, OR BY CROSS-LINKING IT WITH POLY (ETHYLENE GLYCOL). COMPLEXES OF THIS MATERIAL WITH LITHIUM SALTS WILL BE PREPARED AND EVALUATED AS ELECTROLYTES IN LITHIUM CELLS. PROTOTYPE BIPOLAR BATTERIES WILL BE FABRICATED AND EVALUATED.

EIDETICS INTERNATIONAL AF
3669 W 240TH ST
TORRANCE, CA 90505
CONTRACT NUMBER: F33615-87-C-3617
ROBERT W FOLTYN
TITLE:
TACTICAL EVALUATION OF THE AIR-TO-AIR COMBAT EFFECTIVENESS OF SUPERMANEUVERABILITY
TOPIC# 142 OFFICE: AFWAL/FI

THIS PROPOSED WORK REPRESENTS A WIDE SCOPE EFFORT TO DEFINE A METHODOLOGY TO EVALUATE THE TACTICAL MERITS OF SUPERMANEUVERABILITY IN A FIGHTER AIRCRAFT. COMPLETION OF THIS PHASE II EFFORT WILL PRODUCE A DATABASE OF SUPERMANEUVERABILITY INFORMATION AND AN ANALYSIS METHODOLOGY ENCOMPASSING THE FOLLOWING: REFINED LIST OF SUPERMANEUVERS WITH DEFINED "AIR COMBAT WORTH" AND USAGE; REFINED METRICS TO QUANTIFY "AIR COMBAT WORTH" OF ANY SPECIFIC PERFORMANCE PARAMETERS; AN UNDERSTANDING OF THE SENSITIVITIES OF THE TACTICAL UTILITY OF SUPERMANEUVERABILITY VIS-A-VIS THE AIR BATTLE SIZE (M V N); AN APPRECIATION OF THE PILOT REQUIREMENTS FOR SITUATIONAL AWARENESS AND CUEING TO OPTIMALLY EXPLOIT SUPERMANEUVER OPTIONS IN A REALISTIC COMBAT ENVIRONMENT. THE OUTPUT OF THIS STUDY CAN POTENTIALLY BE APPLIED TO THE FINAL DESIGNS AND DEVELOPMENT OF THE ATF. SINCE THRUST VECTORING IS A KEY ENABLING TECHNOLOGY FOR SOME SUPERMANEUVERS, THIS STUDY HAS DIRECT APPLICATION TO ANY ON-GOING AND FUTURE WORK WITH THRUST VECTORING FOR CONTROL...,INCLUDING EITHER RESEARCH OR DESIGN APPLICATIONS TO SUCH FIGHTERS AS THE ATF AND POST...AIRCRAFT. MUCH OF THIS WORK SHOULD ALSO PARALLEL AND COMPLEMENT THE EFFORTS NOW ONGOING...THE X-31A, ENHANCED FIGHTER MANEUVERABILITY (EFM) RESEARCH PROGRAM.

ELECTRO-OPTEK CORP SDIO
3152 KASHIWA ST
TORRANCE, CA 90505
CONTRACT NUMBER:
DR WILLIAM S CHAN
TITLE:
PASSIVELY COOLED InSb DETECTOR ARRAYS
TOPIC# 3 OFFICE:

SUBMITTED BY DEPT

SPACEBORNE SURVEILLANCE SYSTEMS REQUIRE HIGH SENSITIVITY INDIUM-ANTIMONY (InSb) DETECTORS TO OPERATE AT A TEMPERATURE ABOVE 110K,E ACHIEVABLE WITH PASSIVE COOLING. THE UNACCEPTABLE DROP IN SENSITIVITY ABOVE 110K IN InSb DETECTORS IS TRACEABLE TO THREE MAJOR PROBLEM - LOW MINORITY-CARRIER LIFETIME DUE TO LOW MATERIAL QUALITY, HIGH SURFACE LEAKAGE DUE TO POOR PASSIVATION AND HIGH SURFACE LEAKAGE DUE TO BANDGAP NARROWING WITH INCREASE IN TEMPERATURE. RESEARCH IN AN EARLIER PHASE HAS REVEALED THAT ALL EXCEPT THE LAST PROBLEM CAN BE SOLVED BY THE INNOVATIVE TECHNIQUE TO MOLECULAR BEAM EPITAXY (MBE) COUPLED WITH ZONE REFINING. UNDER THE CURRENT RESEARCH EFFORT, SEVERAL TECHNOLOGICAL INNOVATIONS ARE BEING INVESTIGATED TO RESOLVE THESE PROBLEMS. BY EMPLOYING MULTIPLE ZONE REFINING, THE STARTING MATERIALS (In, Sb AND DOPANTS) ARE BEING REFINED TO 99.99999% PURE - AN ORDER OF MAGNITUDE BETTER THAN THE STATE-OF-THE-ART MATERIAL. BY USING MBE GROWTH OF InSb ON A BUFFERED SAPPHIRE SUBSTRATE, A LARGE AREA OF ULTRA-PURE InSb EPITAXIAL MATERIAL IS BEING OBTAINED. BY USING THE SAME MBE PROCESS, AN IN-SITU DOPING OF InSb AND THE FABRICATION OF THE P-N JUNCTION ARE BEING MADE, RESULTING IN A HIGHLY PRODUCIBLE PROCESS OF MATERIAL SYNTHESIS AND DETECTOR FABRICATION.

ELECTRO-OPTEK CORP AF
23887 MADISON ST
TORRANCE, CA 90505
CONTRACT NUMBER: 87-25090
WILLIAM S CHAN
TITLE:
SEEKER-TO-TARGET CLOSURE SIMULATOR
TOPIC# 25 OFFICE: AFATL/ASA

PHASE II IS A 24-MONTH PROGRAM STRUCTURED FOR A SYSTEMATIC DEVELOPMENT OF THE MOS-RESISTOR ARRAY TECHNOLOGY, AIMED AT PRODUCING AN INFRARED TARGET SIMULATOR (IRTS) TO SIMULATE SEEKER-TO-TARGET RANGE CLOSURE CONDITIONS. THE OBJECTIVES FOR THIS PHASE ARE: YEAR 1, FABRICATE AND TEST A 4 X 4 TEST ARRAY BASED ON THE MOS-RESISTOR ARRAY TECHNOLOGY CONCEIVED AND ANALYZED IN PHASE I TO ESTABLISH THE PROCESSING TECHNOLOGY AND THE MOS-RESISTOR BEHAVIOR UNDER VARIOUS CURRENT CONDITIONS. YEAR 2, DESIGN, FABRICATE AND TEST A 128 X 128 ARRAY TO DEMONSTRATE THE HIGH FRAME RATE DYNAMICS REQUIRED FOR SEEKER-TO-TARGET RANGE CLOSURE SIMULATION AND TO ESTABLISH YIELD FOR

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FABRICATING THE 512 X 512 ARRAY. SEVERAL INNOVATIONS ARE OFFERED TO RESOLVE THE CRITICAL PROBLEMS OF DEVELOPING THE SIMULATOR, AND THESE ARE SYSTEMATICALLY IMPLEMENTED IN THE DURATION OF THE PROPOSED PROGRAM. THE CRITICAL PROBLEMS ADDRESSED ARE HIGH FRAME RATE, HIGH INTENSITY DYNAMIC RANGE, HIGH THERMAL TIME RESPONSE, WIDE SPECTRAL RANGE, LOW FLICKER EFFECT AND LOW YIELD IN LARGE ARRAY PROCESSING.

ELECTRONIC DECISIONS INC SDIO
1776 E WASHINGTON
URBANA, IL 61801
CONTRACT NUMBER:
DR DANIEL A FLEISCH
TITLE:
INFRARED FOCAL PLANE ARRAY MULTIPLEXING - NEW APPROACH
TOPIC# 3 OFFICE:

AN IMPORTANT PROBLEM IN THE AREA OF IR FOCAL PLANE ARRAY IMAGING IS THE FAST AND EFFICIENT MULTIPLEXING AND PROCESSING OF THE SIGNALS FROM THE DETECTOR ARRAY. A NEW APPROACH TO THIS PROBLEM UTILIZING THE RECENTLY DEVELOPED ACOUSTIC CHARGE TRANSPORT (ACT) DEVICE IS PRESENTED. THE ACT DEVICE COMBINES SURFACE ACOUSTIC WAVE AND CHARGE TRANSPORT TECHNOLOGIES TO ACHIEVE A LOW-NOISE, HIGH-THROUGHPUT MULTIPLEXER IMPLEMENTED IN GALLIUM ARSENIDE WHICH OFFERS THE POTENTIAL FOR ADDITIONAL ON-PLANE PROCESSING. THE PROPOSED PROGRAM USES AN EXISTING ACT DEVICE TO DEMONSTRATE AND EVALUATE THE ACT MULTIPLEXER. THIS DEVICE WILL BE OPERATED AT CRYOGENIC TEMPERATURES USING VISIBLE LIGHT AT THE INPUTS TO SIMULATE AN IR DETECTOR ARRAY. EXPERIMENTAL MEASUREMENTS OF FUNDAMENTAL PERFORMANCE PARAMETERS SUCH AS NOISE LEVEL, CHARGE CAPACITY, AND PIXEL-TO-PIXEL UNIFORMITY WILL BE MADE AND COMPARED TO THEORY. THE RESULTS WILL BE EXTRAPOLATED ANALYTICALLY TO PROJECT THE PERFORMANCE OF AN OPERATIONAL ACT IR FOCAL PLANE ARRAY MULTIPLEXER.

ENERGY CONVERSION DEVICES INC SDIO
1675 W MAPLE RD
TROY, MI 48084
CONTRACT NUMBER:
DR JOSEPH HANAK
TITLE:
ADVANCED HIGH ENERGY ULTRALIGHT PHOTOVOLTAIC ARRAY FOR NON-NUCLEAR SPACE POWER
TOPIC# 5 OFFICE:

SUBMITTED BY DEPT

UNDER A PREVIOUS RESEARCH PHASE, A PROTOTYPE WAS DEVELOPED OF A HIGH VOLTAGE (371 VOLT) PHOTOVOLTAIC BASED ON THIN-FILM AMORPHOUS SILICON ALLOY MULTIJUNCTION SOLAR CELLS. THE ARRAY HAS A POWER DENSITY OF OVER 162 W/kg AND POWER OUTPUT OF 42 WATTS UNDER AIR MASS 1 ILLUMINATION. IT IS A SINGLE-PIECE, FLEXIBLE, ROLLUP, REDEPLOYABLE, DAMAGE TOLERANT, AND HIGHLY RADIATION-RESISTANT ARRAY. UNDER THE CURRENT EFFORT, ENABLING TECHNOLOGY, MATERIALS AND PROCESSES ARE BEING DEVELOPED AND DEMONSTRATED TOWARD THE MANUFACTURE OF SPACE-COMPATIBLE, ULTRALIGHT PHOTOVOLTAIC ARRAYS HAVING PERFORMANCE CAPABILITIES ONE ORDER OF MAGNITUDE BEYOND THE STATE OF THE ART. SPACE-COMPATIBLE, FLEXIBLE ENCAPSULANTS ARE BEING CONSTRUCTED. AN OPTIONAL PLAN TO FLIGHT TEST THE MODULE IS BEING PROVIDED AND FOUR, ONE SQUARE METER, SPACE-COMPATIBLE ARRAYS, EACH HAVING A POWER OUTPUT OF 60 WATTS AT 150 VOLTS AND POWER DENSITY OF 300 W/kg ARE BEING CONSTRUCTED. WHEN SUCCESSFULLY DEMONSTRATED, THE MANUFACTURING CAPABILITY OF HIGH-ENERGY DENSITY, HIGH-PERFORMANCE, ULTRALIGHT SPACE-COMPATIBLE ARRAYS WILL BE FACILITATED WITH APPLICATIONS SUCH AS EMERGENCY PORTABLE POWER PLANTS IN DEFENSE AND SPACE, AS WELL AS FOR LAND DEVELOPMENT, IRRIGATION, WATER PURIFICATION, AND MINING.

ENERGY OPTICS INC NAVY
PO BOX 15052 - 224 N CAMPO ST
LAS CRUCES, NM 88004
CONTRACT NUMBER:
JOHN H STOKES
TITLE:
GASEOUS TRITIUM LIGHT SOURCE
TOPIC# 130 OFFICE: NWC/NAVAIR

THIS DEVELOPMENT PROJECT IS A CONTINUATION OF RESEARCH CONDUCTED AS A SUCCESSFUL PHASE I FEASIBILITY STUDY. THE GTLS PROGRAM IS STRUCTURED TO DEVELOP A METHOD OF TRANSMITTING A LIGHT-ENHANCED, MISSILE FUZE, SAFE/ARM SYMBOL TO A MORE ACCESSIBLE LOCATION ON MISSILE AND TO AID ORDNANCE HANDLING PERSONNEL. A COMPLETE GTLS SYSTEM WILL BE ABLE TO TRANSMIT A QUALITY IMAGE, UTILIZING FIBER OPTICS AND A SELF-POWERED LIGHT SOURCE FOR UP TO 20 YEARS. THE PHASE II PROGRAM IS EXPECTED TO PROVIDE PRODUCTION QUALITY PROTOTYPES AND SUFFICIENT DOCUMENTATION FOR FULL-SCALE MANUFACTURING.

ENTECH INC SDIO
PO BOX 612246
DAL-FT. WOR. ARPT, TX 75261
CONTRACT NUMBER:
MARK J O'NEILL
TITLE:
DOME FRESNEL LENS/GALLIUM ARSENIDE PHOTOVOLTAIC CONCENTRATOR ARRAY WITH AN AMMO OPERATIONAL ARRAY EFFICIENCY GREATER THAN 20%
TOPIC# 5 OFFICE:

SUBMITTED BY DEPT

UNDER A PREVIOUS RESEARCH PHASE, A NEW APPROACH TO PHOTOVOLTAIC CONCENTRATOR ARRAY FOR SPACE POWER APPLICATIONS WAS DESIGNED, FABRICATED, AND TESTED USING A GALLIUM ARSENIDE CELL AND A PRISMATIC CELL COVER TO VERIFY THE PERFORMANCE LEVELS PREDICTED FOR THE COVERED CELL. THE OVERALL FEASIBILITY OF THIS LIGHTWEIGHT, MINI-DOME FRESNEL LENS PHOTOVOLTAIC ARRAY WAS GREATLY ADVANCED DEMONSTRATING RECORD PRISM-COVERED CELL PERFORMANCE LEVELS UNDER BOTH SPACE AND TERRESTRIAL CONDITIONS. UNDER THE CURRENT RESEARCH AN ULTRALIGHT VERSION OF THE MINI-DOME FRESNEL LENS/GALLIUM ARSENIDE PHOTOVOLTAIC CONCENTRATOR PANEL IS BEING DEVELOPED AND GROUND TESTED FOR SPACE POWER APPLICATIONS. SPECIFICALLY, THE TECHNICAL FEASIBILITY IS BEING DEMONSTRATED OF ACHIEVING A SPACE ARRAY SPECIFIC POWER OF 170 OUTPUT WATTS PER KILOGRAM OF ARRAY MASS AND A SPACE ARRAY EFFICIENCY CHARACTERIZED BY 230 OUTPUT WATTS PER SQUARE METER OF ARRAY AREA. A PROTOTYPE PANEL IS BEING FABRICATED, RATED AT ABOUT 60 WATTS, WHICH INCLUDES DEVELOPING THREE NEW LIGHTWEIGHT COMPONENTS (MINI-DOME FRESNEL LENS OPTICAL CONCENTRATOR, RADIATOR, AND HONEYCOMB SUPPORT STRUCTURE) AS WELL AS USING THE PREVIOUSLY TESTED PROVEN PRISM-COVERED GaAs CELLS. THE PROTOTYPE PANEL IS BEING GROUND TESTED AND DOCUMENTED UNDER TERRESTRIAL SUNLIGHT IRRADIANCE TO VERIFY THE PREDICTED PERFORMANCE LEVELS.

EPOCH ENGINEERING INC NAVY
806 W DIAMOND AVE
GAITHERSBURG, MD 20878
CONTRACT NUMBER:
E H BEACH
TITLE:
IMPROVED SWITCHING CONCEPTS FOR S-A DEVICES
TOPIC# 133 OFFICE: NWC/NAVSEA

THE PROJECT OBJECTIVES ARE THE DEVELOPMENT OF S-A DEVICES THAT ARE EXTREMELY RELIABLE, THAT PROVIDE A HIGH LEVEL OF SAFETY TO USER FORCES IN STORAGE, TRANSPORTATION, LOAD-OUT AND TACTICAL USE, AND THAT ARE EASILY MANUFACTURABLE WITH REASONABLE COST. THE S-A DEVICES MUST FUNCTION AS INTENDED UNDER A BROAD SPECTRUM OF ENVIRONMENTS: SHOCK, VIBRATION, TEMPERATURE EXTREMES AND ELECTROMAGNETIC RADIATION. KEY TO THIS DEVELOPMENT ARE THE INTRODUCTION OF SWITCHING CONCEPTS THAT MINIMIZE OR ELIMINATE SLIDING OR RUBBING CONTACTS AND UTILIZE PHOTO-OPTICS OR OTHER SOLID-STATE COMPONENTS.

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EXPERT-EASE SYSTEMS INC DARPA
1301 SHOREWAY RD - STE 420
BELMONT, CA 94002
CONTRACT NUMBER:
ROBERT E LARSON
TITLE:
RECONFIGURABLE DISTRIBUTED COMPUTER SYSTEM FOR ON-BOARD SATELLITE APPLICATIONS
TOPIC# 22 OFFICE: DARPA

A PARTICULARLY CHALLENGING AREA FOR THE APPLICATION OF MILITARY COMPUTER SYSTEMS IS THOSE CASES IN WHICH THE SYSTEM MUST OPERATE AUTONOMOUSLY IN A HOSTILE OR REMOTE ENVIRONMENT FOR MANY YEARS. ON-BOARD SATELLITE COMPUTER SYSTEMS ARE A GOOD EXAMPLE OF SUCH AN APPLICATION. THE PROPOSED EFFORT WILL RESULT IN A NEW GENERATION OF RECONFIGURABLE, DISTRIBUTED COMPUTING SYSTEMS WHOSE ARCHITECTURE CAN BE ADAPTED TO BEST FIT THE CURRENT COMPUTING NEEDS. THESE SYSTEMS WILL COMBINE NEW CONCEPTS IN ADAPTIVELY MODIFIED HARDWARE AND SOFT-WARE ARCHITECTURE, TOGETHER WITH NEW TECHNOLOGY FOR DYNAMIC ALLOCA-TION OF THE SYSTEM RESOURCES TO OPTIMIZE SOME MEASURE OF SYSTEM EFFECTIVENESS. THE ADVANTAGES OF THIS NEW TYPE OF SYSTEM INCLUDE: INCREASED ON-BOARD INTELLIGENCE (OBTAINED BY MAKING MOST EFFICIENT USE OF THE GIVEN SYSTEM RESOURCES); INCREASED SYSTEM AVAILABILITY (OBTAINED BY ISOLATING FAILURES AND REALLOCATING SYSTEM RESOURCES TO REPLACE FAILED UNITS); ADAPTIVE RESPONSE TO REAL-TIME LOAD (A FEATURE OF THE DYNAMIC ALLOCATION PROCEDURE); AND EXTENDED LIFE CYCLE (OBTAINED BY REALLOCATION OF THE SYSTEM RESOURCES IN RESPONSE TO GROUND-ORDER MODIFICATIONS TO ALGORITHMS AND SOFTWARE.

FASTMAN INC NAVY
BEN FRANKLIN TECH CTR HRL BLDG F
BETHLEHEM, PA 18015
CONTRACT NUMBER:
MICHAEL TUCKER
TITLE:
THE CONSTRUCTION OF A DEMONSTRATION ROBOTIC WORKCELL FOR APPLICATIONS REQUIRING HIGH ACCURACY
TOPIC# 101 OFFICE: NSWC/SSPO

SUBMITTED BY DEPT

FASTMAN, INC. PROPOSES TO CONSTRUCT A ROBOTIC WORKCELL IN ORDER TO DEMONSTRATE OUR CALIBRATION SYSTEM WHICH HAS BEEN DESIGNED TO IMPROVE ROBOT ACCURACY AND LONG-TERM REPEATABILITY. THE WORKCELL WILL CONTAIN A MEASUREMENT SYSTEM WHICH WILL MEASURE THE POSITION AND ORIENTATION OF THE ROBOT'S END EFFECTOR TO AN ACCURACY OF .5 MIL, A PARAMETER IDENTIFICATION ALGORITHMS WHICH DETERMINES AN ACCURATE MODEL OF THE ROBOT'S LINKAGE AND A CONTROL ALGORITHM WHICH USES THE ACCURATE MODEL TO REDUCE THE ROBOT'S POSE PLACEMENT ERRORS. THE WORKCELL WILL ALSO CONTAIN SOFTWARE ROUTINES WHICH WILL GIVE AN OPERATOR A REAL-TIME GRAPHICAL DISPLAY OF THE REPEATABILITY AND ACCURACY PERFORMANCE OF A ROBOT. WE HAVE DESIGNED THE CALIBRATION SYSTEM TO GIVE A REAL-TIME AND CONTINUOUS MEASUREMENT OF THE PERFORMANCE OF A ROBOT AND TO CORRECT ITS PERFORMANCE WHEN IT DEGRADES. WE EXPECT THAT OUR CALIBRATION SYSTEM WILL IMPROVE THE PRODUCTIVITY OF ONLINE AND OFFLINE PROGRAMMED ROBOTS BY: DECREASING THE NEED FOR OPERATORS TO RETRAIN ROBOT TASKS, ALLOWING ROBOT PROGRAMS TO BE SIMULATED OFFLINE AND DOWNLOADED TO A ROBOT AND ALLOWING PROGRAMS TO BE TRANSPORTED TO ROBOTS OTHER THAN THE ONE ON WHICH IT WAS TRAINED.

FIBERTEK INC ARMY
510-A HERNDON PKWY
HERNDON, VA 22070
CONTRACT NUMBER:
DR HORACIO R VERDUN
TITLE:
NEW MATERIALS FOR TUNABLE SOLID-STATE LASERS
TOPIC# 66 OFFICE: CECOM/NV

FIBERTEK, INC. PROPOSES GROWTH OF NEW, HIGH EFFICIENCY SOLID STATE LASER MATERIALS, FOR THE FIRST TIME, APPLYING A CHEMICAL VAPOR DEPOSITION (CVD) TECHNIQUE TOWARDS THE DESIGN AND TAILORING OF ADVANCED LASERS. BASED UPON INITIAL EXPERIMENTS PERFORMED DURING PHASE I, IT IS PROPOSED FOR PHASE II TO FOCUS ON V(4+) AND Ti(4+) DOPANTS, INCORPORATED IN PEROVSKITE, ELPASOLITE AND GARNET CRYSTAL HOSTS. RESULTING MATERIALS WILL BE CHARACTERIZED IN TERMS OF THEIR PERFORMANCE FOR LASER OPERATION. IN AN ITERATIVE PROCESS THE NECESSARY MODIFICATION OF THE CVD REACTION WILL BE MADE IN ORDER TO OPTIMIZE THE DEVELOPMENT OF THE LASER MATERIALS.

FIBERTEK INC NAVY
510-A HERNDON PKWY
HERNDON, VA 22070
CONTRACT NUMBER:
DR WALTER KOECHNER
TITLE:
HIGH REPETITION RATE SOLID-STATE LASER FOR BOTTOM MAPPING
TOPIC# 14 OFFICE: MARINE CORPS

SUBMITTED BY DEPT

THE PHASE I WORK PROPOSED AND SHOWED A LASER CAPABLE OF PRODUCING LIGHT AT A HIGH PULSE REPETITION RATE IN THE BLUE-GREEN NEAR-SHORE SEAWATER OPTICAL PENETRATION REGION. IN PHASE II A LASER WILL BE DESIGNED, PROTOTYPE FABRICATED AND DEMONSTRATED USING OPERATIONAL PARAMETERS.

FLOW RESEARCH CO NAVY
21414 68TH AVE S
KENT, WA 98032
CONTRACT NUMBER:
R P TURCOTTE
TITLE:
HIGH TEMPERATURE CERAMICS
TOPIC# 123 OFFICE: NSWC/SSPO

A DEVELOPMENT EFFORT IS PROPOSED TO IDENTIFY CERTAIN BINARY AND TERNARY (DOPED) OXIDES BASED ON Zr, Hf, AND RARE EARTH ELEMENTS, HAVING EXTREMELY LOW OXYGEN DIFFUSION COEFFICIENTS. IT IS PROPOSED THAN CERTAIN CARBIDE AND BORIDE CERAMICS HAVING COMPOSITIONS RELATED TO THE LOW DIFFUSIVITY OXIDES BE PREPARED AND EVALUATED FOR THEIR RESISTANCE TO OXIDATION. THE PROGRAM INCLUDES EVALUATION OF THESE MATERIALS AS PROTECTIVE COATINGS AND AS MONOLITHIC COMPONENTS FOR POTENTIAL USE IN AIR BREATHING JET ENGINES. STUDIES INCLUDE EVALUATION OF HIGH TEMPERATURE PHASE BEHAVIOR, MELTING POINTS, AND OXYGEN DIFFUSION/OXIDATION BEHAVIOR IN COMBUSTION GASES.

FLOW RESEARCH CO AF
21414 68TH AVE S
KENT, WA 98032
CONTRACT NUMBER:
DR SURESH MENON
TITLE:
HYPERSONIC FLOWS AROUND A GASJET NOSETIP
TOPIC# 193 OFFICE: BMO/MYSC

ACTIVE COOLING BY A GASJET IS CONSIDERED FOR A SEVERE ENTRY NOSETIP (SENT) IN A HIGH-REYNOLDS-NUMBER HYPERSONIC FLOW. THE CURRENT RESEARCH INTENDS TO DEVELOP A THREE-DIMENSIONAL NAVIER-STOKES COMPUTATIONAL CODE FOR PREDICTING AND OPTIMIZING THE COOLING PERFORMANCE OF

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THE GASJET. THE RESEARCH IS FOCUSED ON DEVELOPING A FINITE-VOLUME MULTISTAGE MULTIGRID SCHEME IN WHICH THE STRONG BOW SHOCK IS RESOLVED ACCURATELY BY A SHOCK-FITTING METHOD WHILE THE WEAKER EMBEDDED SHOCK WAVES ARE CAPTURED ACCURATELY BY A TOTAL VAIATION DIMINISHING SCHEME. MIXING OF THE AIR AND THE INJECTED GAS WILL BE SIMULATED BY SOLVING SPECIES CONVECTION-DIFFUSION EQUATIONS. REALISTIC NOSETIP GEOMETRIES WILL BE CONSIDERED. THIS INNOVATIVE RESEARCH IS EXPECTED TO PRODUCE A CODE THAT IS ACCURATE, EFFICIENT AND VERSATILE FOR PRACTICAL APPLICATIONS.

FLUID PHYSICS IND DNA
4265 MANCHESTER AVE
ENCINITAS, CA 92024
CONTRACT NUMBER: DNA87-C-0307
RICHARD M TRACI
TITLE:
COMPUTATIONAL DESIGN ANALYSIS OF DUSTY FLOW PRESSURE GAUGES
TOPIC# 3 OFFICE: AM

THE PROBLEM OF PRESSURE GAUGE DESIGN IMPROVEMENTS FOR REDUCED UNCERTAINTY OF FLOW PROPERTY MEASUREMENTS IN PARTICLE-LADEN "DUSTY" FLOWS IS ADDRESSED USING AN ADVANCED NUMERICAL MODEL SIMULATION TECHNIQUE TO STUDY PRESSURE GAUGE RESPONSE IN DUSTY FLOWS. THE FEASABILITY OF THE APPROACH WAS DEMONSTRATED IN A PHASE I SBIR PROGRAM. AND IT PROVIDES THE CENTRAL ELEMENT OF A GAUGE DESIGN METHODOLOGY WHICH WILL BE DEVELOPED AND APPLIED IN THE PROPOSED PHASE II SBIR PROGRAM. ITS OBJECTIVE IS THE DEMONSTRATION OF A COMPLETE ANALYSIS METHODOLOGY FOR DUSTY FLOW PRESSURE GAUGE DESIGN. STUDIES IN FOUR MAIN AREAS WILL BE PERFORMED: i) MODELING AND MECHANISM SENSITIVITY STUDIES, ii) MODEL VALIDATION AND FIELD TEST DATA ANALYSES, iii) GAUGE DESIGN METHODOLOGY DEVELOPMENT AND APPLICATION, iv) COMMERCIALIZATION AND FUTURE R&D ASSESSMENT. THE SENSITIVITY STUDIES COMPLETE THE PHASE I DEVELOPMENT BY: IMPROVING THE PARTICLE-GAUGE REFLECTION CONDITION, EXAMINING TURBULENT VISCOUS EFFECTS, IMPLEMENTING A PARTICLE COLLISION MODEL AND ASSESSING THREE-DIMENSIONAL FLOW EFFECTS. THE IMPROVED MODEL WILL THEN BE VALIDATED AGAINST RECENT DUSTY SHOCKTUBE GAUGE CALIBRATION DATA AND USED TO EVALUATE CURRENT AMBIGUITIES IN GREG/SNOB DATA FROM RECENT IMPORTANT FIELD TESTS. THE GAUGE DESIGN METHODOLOGY STUDIES ARE THE FOCUS OF THE PHASE II PROGRAM. THEY INCLUDE EXTENSIVE DUSTY FLOW PARAMETER STUDIES FOR A BASELINE GAUGE

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DESIGN, DEVELOPMENT OF AN ELECTROMECHANICAL GAUGE RESPONSE MODEL, AND PERFORMANCE OF GREG/SNOB GAUGE OPTIMIZATION STUDIES. OPTIMIZATION STUDIES.

FLUOROCHEM INC SDIO
680 S AYON AVE
AZUSE, CA 91702
CONTRACT NUMBER:
KURT BAUM
TITLE:
CUBANE DERIVATIVES FOR PROPELLANT APPLICATIONS
TOPIC# 6 OFFICE:

ADVANCES ARE NEEDED IN PROPELLANT FORMULATIONS, PARTICULARLY FOR PROPELLANTS WITH HIGH SPECIFIC IMPULSE (Isp) FOR APPLICATIONS REQUIRING RAPID ORBIT MANEUVERS OR WEAPONS LAUNCHES. AN APPROACH WHICH HAS RECEIVED LITTLE CONSIDERATION IS THE USE OF CUBANE DERIVATIVES AS PROPELLANT INGREDIENTS WITH THEIR HIGH CHEMICAL STABILITY AND HIGH THERMODYNAMIC STRAIN ENERGY. IN THE PREVIOUS RESEARCH PHASE, CUBANE DERIVATIVES WERE STUDIED AND CHARACTERIZED FOR THEIR POTENTIAL UTILITY AS EXPLOSIVES AND PROPELLANTS AND AS BINDER AND FUEL ADDITIVES. THE PREPARATION OF CUBANE-1,4-DICARBOXYLIC ACID WAS STUDIED THAT HAS RESULTED IN IMPROVEMENTS OF YIELDS AND TECHNIQUES WHICH WILL ALLOW PREPARATION OF KILOGRAM QUANTITIES. UNDER THE CURRENT RESEARCH EFFORT, NEW POLYNITRO CUBANES CONTAINING ENERGETIC FUNCTIONAL GROUPS AND CUBANE-BASED POLYMERS ARE BEING PREPARED AND TESTED; AND SCALE-UP OF KEY CUBANE INTERMEDIATES CARRIED OUT. SINCE THE PROCESS RESEARCH ON THE PREPARATION OF CUBANE-1,4-DICARBOXYLIC ACID IS AT A MORE ADVANCED STAGE OF DEVELOPMENT, ADVANCES ARE EXPECTED TO BE MADE THAT WILL ESTABLISH THE BASIS FOR PILOT PLANT SCALE PRODUCTION AND WILL ALLOW SUBSTANTIAL COST REDUCTION OF THIS KEY INTERMEDIATE.

FOSTER ENGINEERING CO AF
23241 VENTURA BLVD - STE 309
WOODLAND HILLS, CA 91364
CONTRACT NUMBER:
KENNETH FOSTER
TITLE:
TAM - TARGET ACTIVATED MUNITION
TOPIC# 192 OFFICE: BMO/MYSC

SUBMITTED BY DEPT

AN 18-MONTH PHASE II EFFORT ON TAM-TARGET ACTIVATED MUNITION, IS PROPOSED BY FOSTER ENGINEERING WITH FORD AEROSPACE AERONUTRONIC DIVISION AND R&D ASSOCIATES AS BUSCONTRACTORS. TAM IS A LOW WEIGHT, BALLISTICALLY DELIVERED STAND ALONE MUNITION WHICH, AFTER LANDING, WOULD DETECT AND THEN FIRE A CLOUD OF FLECHETTES AT A JUST-LAUNCHED MOBILE ICBM (MICBM). TAM IS WELL SUITED FOR USE IN A PROTRACTED CONFLICT, THE MOST LIKELY TYPE OF CONFLICT IN AN ERA WHEN BOTH THE U.S. AND THE SOVIETS ARE SHIFTING FROM FIXED TO MOBILE ICBM LAUNCHERS. KEY FEASIBILITY ISSUES WILL BE INVESTIGATED BY BOTH ANALYTICAL AND EXPERIMENTAL MEANS. ANALYSIS OF VARIOUS BALLISTIC DELIVERY APPROACHES WILL DETERMINE THE MAXIMUM ALLOWABLE WEIGHT FOR THE TAM. PRELIMINARY DESIGNS AND COMPUTER SIMULATIONS WILL BE USED TO MINIMIZE TAM WEIGHT AND ASSURE THAT TAM CAN ACHIEVE A SMALL ENOUGH MISS DISTANCE. EXPERIMENTS CONCERNING KEY FEASIBILITY ISSUES OF THE SYSTEM, NOT AMENABLE TO ANALYSIS, WILL INVOLVE TAM LANDING AND PREPARATION FOR LAUNCH FROM TREETOP FOLIAGE.

FOSTER-MILLER INC NAVY
350 SECOND AVE
WALTHAM, MA 02254
CONTRACT NUMBER:
DAVID A EVANS
TITLE:
Z-DIRECTION TAPE REINFORCEMENT FOR COMPOSITE LAMINATES
TOPIC# 132 OFFICE: NWC/NAVAIR

COMPOSITE LAMINATES MADE FROM CONVENTIONAL GRAPHITE EPOXY ARE PRONE TO DELAMINATION DUE TO IMPACT OR EDGE EFFECTS. SOME MEANS OF IMPROVING COMPRESSIVE STRENGTH AFTER IMPACT IS DESIRED. STITCHING IS ONE OPTION, BUT CAUSES DAMAGE TO IN-PLANE PROPERTIES AND REQUIRES ACCESS TO BOTH SIDES OF THE LAYUP. THE TECHNIQUE DEMONSTRATED IN PHASE I USES SHORT BORON FIBERS ORIENTED IN THE Z-DIRECTION (I.E., THROUGH THE THICKNESS OF THE LAMINATES) TO INCREASE THE CRITICAL STRAIN ENERGY RELEASE RATE (G[IC]) AND RETARD DELAMINATION. THE FIBERS ARE INSERTED FROM A SPECIALLY DEVELOPED REINFORCING TAPE. THE TECHNIQUE IS COMPLETELY COMPATIBLE WITH STANDARD COMPOSITES PROCESSES AND CAN BE PERFORMED ON-TOOL. THE PROPOSED PHASE II EFFORT WILL DEVELOP A PREPRODUCTION MACHINE TO MANUFACTURE THE TAPE, DEVELOP DATA FOR THE PROPERTIES OF LAMINATES WITH THE REINFORCEMENT, AND TRANSFER THE TECHNOLOGY TO END USERS.

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FOSTER-MILLER INC AF
350 SECOND AVE
WALTHAM, MA 02254
CONTRACT NUMBER: F33615-87-C-3417
DANIEL FISCHBACH
TITLE:
DEMONSTRATION OF IMPROVED PINS AND BUSHINGS FOR AIRCRAFT LANDING GEAR JOINTS
TOPIC# 146 OFFICE: AFWAL/FI

THE COST OF REFURBISHING THE JOINTS OF AIRCRAFT LANDING GEAR IS SUBSTANTIAL. DURING GEAR OVERHAUL, BUSHINGS ARE REPLACED AND LUGS REFINISHED EVEN IF BUSHINGS APPEAR UNWORN, SO THAT LUG-BUSHING INTERFACES CAN BE INSPECTED. IN PHASE I WE SHOWED THAT HARD BUSHINGS AND SOFT-COATED PINS COULD SURVIVE WELL UNDER HIGH, UNRELIEVED STRESSES AND CYCLIC MOTION TYPICAL OF AIRCRAFT GEAR. IN ADDITION, WE SHOWED THAT SOME HARD COATINGS ON AIRCRAFT STEEL AND ALUMINUM LUGS COULD REPLACE HARD BUSHINGS, THEREBY FURTHER SIMPLIFYING THE INITIAL FABRICATION AS WELL AS THE FUTURE INSPECTION AND MAINTENANCE OF JOINTS. BOTH COMMON AND PROPRIETARY MATERIALS AND COATINGS WERE TRIED. WE, WITH MENASCO, INC. SUBCONTRACTOR, PROPOSE TO REFINE THE SELECTION OF MATERIALS AND DESIGN PARAMETERS FOR MAINTENANCE-FREE LUGS, AND TO DEMONSTRATE THE INTEGRITY OF SO-DESIGNED JOINTS BY COMPLETE LIFE CYCLE FATIGUE TESTS OF SINGLE SIMULATED JOINTS IN LABORATORY DYNAMIC TEST FIXTURES. IN ADDITION, WE WILL SPECIFY FUTURE MANUFACTURING PROCESSES, QUANTIFY LIFE CYCLE COST SAVINGS, AND ESTIMATE THE APPROPRIATE NEXT STEPS FOR PHASE III.

FOSTER-MILLER INC AF
350 SECOND AVE
WALTHAM, MA 02254
CONTRACT NUMBER: F33615-87-C-5341
DR ROBERT F KOVAR
TITLE:
LOW-COST SYNTHESIS OF POLY(BENZOBISTHIAZOLE) WITH ENHANCED MECHANICAL PROPERTIES
TOPIC# 166 OFFICE: AFWAL/ML

SUBMITTED BY DEPT

THE PURPOSE OF THE PHASE II PROGRAM IS TO DEMONSTRATE IMPROVED PERFORMANCE IN ENGINEERING STRUCTURES BASED ON THE EXCEPTIONAL MECHANICAL, THERMAL, ELECTRICAL, CHEMICAL AND OPTICAL PROPERTIES OF PBT ORDERED POLYMERS. PHASE I DEMONSTRATED THE FEASIBILITY OF PREPARING Cis PBT IN HIGH YIELD, VIA A RAPID, LOW-COST ROUTE. THE RESULTS OF THIS STUDY ALSO LED TO NOVEL CONCEPTS THAT WILL SOLVE TWO MAJOR PROBLEMS INVOLVING ORDERED POLYMERS; NAMELY, POOR COMPRESSIVE STRENGTH AND LOW INTERLAMINAR SHEAR STRENGTH. THE PHASE II EFFORT WILL ADDRESS THE FOLLOWING: POLYMERIZATION OF Cis PBT TO HIGH MOLECULAR WEIGHT IN LARGER QUANTITIES, SYNTHESIS OF PBT CONTAINING ARTICULATED MONOMER LINKAGES, EXTRUSION OF FIBERS AND FILMS FROM Cis, TRANS AND ARTICULATED PBT AND DEMONSTRATION OF IMPROVED COST AND PERFORMANCE OVER OTHER MATERIALS BY MECHANICAL CHARACTERIZATION. SUCCESSFUL COMPLETION OF PHASE II WILL GREATLY ACCELERATE THE COMMERICAL DEVELOPMENT OF PBT ORDERED POLYMERS BY LOWERING COST, INCREASING AVAILABILITY AND SOLVING THE PROBLEMS THAT HAVE LIMITED THEIR APPLICATION AS SPACE AND AEROSPACE STRUCTURES.

FOSTER-MILLER INC AF
350 SECOND AVE
WALTHAM, MA 02254
CONTRACT NUMBER:
ALAN LANE
TITLE:
COHERENT INFRARED OPTIC IMAGE BUNDLE FOR AIRCRAFT IR IMAGING SYSTEMS
TOPIC# 118 OFFICE: AFWAL/AA

THE EXACT PLACEMENT AND PACKAGING OF INFRARED IMAGING SENSORS ABOARD HIGH PERFORMANCE AIRCRAFT IS LIMITED BY CONCERNS FOR AIRCRAFT RADAR CROSS SECTION, AIRCRAFT AERODYNAMICS AND THE FACT THAT EACH SENSOR MUST BE CLOSE-COUPLED TO ITS MATED DETECTOR/DEWAR MODULE. PRESENT TECHNOLOGY LIMITS THE ABILITY TO TRANSMIT IR IMAGE QUALITY LIGHT SIGNALS FROM OPTICS TO AN IMAGE DETECTOR. PHASE I SHOWED FEASIBILITY OF TRANSMITTING IR IMAGES THROUGH A 2-METER, COHERENT, FIBER OPTIC BUNDLE MADE FROM HEAVY METAL FLUORIDE GLASSES (HMFG). IN PHASE II, WE WILL DEMONSTRATE AN IR IMAGING SYSTEM OPERATING IN THE 3 TO 5 um (MICROMETERS) ATMOSPHERIC WINDOW USING A 5-METER COHERENT FIBER OPTIC BUNDLE BETWEEN THE ENTRANCE APERTURE AND THE DETECTOR/DEWAR. RESULTS OF THIS DEMONSTRATION PROGRAM WILL PROVIDE THE NECESSARY INFORMATION

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REQUIRED TO CONFIGURE A COMPLETE SYSTEM CAPABLE OF MEETING AIR FORCE REQUIREMENTS FOR AIRCRAFT IR IMAGING SYSTEMS.

FOSTER-MILLER INC AF
350 SECOND AVE
WALTHAM, MA 02254
CONTRACT NUMBER:
SCOTT HYNEK
TITLE:
HIGH TEMPERATURE HEAT PIPES
TOPIC# 51 OFFICE: RADC/XPX

GALLIUM ARSENIDE CZOCHRALSKI CRYSTAL GROWERS ARE HAMPERED BY UNCONTROLLED AZIMUTHAL TEMPERATURE VARIATIONS IN THE MELT. TOROIDAL HEAT PIPES, SURROUNDING THE CRUCIBLE CONTAINING THE MELT, HAVE BEEN SUGGESTED AS A WAY TO REDUCE THESE TEMPERATURE VARIATIONS. THESE HEAT PIPES WOULD HAVE TO WORK AT 1350 DEG C FOR SHORT PERIODS AND AT 1250 DEG C INDEFINITELY. TWO HEAT PIPES WERE BUILT ACCORDING TO A NEW (AND PROPRIETARY) PROCESS, USING MAGNESIUM AS THE WORKING FLUID, SURROUNDED BY MOLYBDENUM (HIGH TEMPERATURE STRENGTH, CHEMICAL INERTNESS, AND VAPOR IMPERMEABILITY), AND THEN BY ALUMINA (OXIDATION RESISTANCE). THIS TOROIDAL HEAT PIPE WILL BE OPTIMIZED, AND SIX HEAT PIPES WILL BE ASSEMBLED INTO A CZOCHRALSKI CRUCIBLE HEATER. SIMILAR TECHNOLOGY WILL BE USED TO MAKE A HEAT PIPE SUSCEPTOR FOR EPITAXIAL MO-CVD OF GaAs, TO MINIMIZE VARIATIONS IN TEMPERATURE (HENCE DEPOSITION RATES, HENCE EVENTUAL PERFORMANCE) ACROSS THE WAFER'S SURFACE.

FOSTER-MILLER INC AF
350 SECOND AVE
WALTHAM, MA 02254
CONTRACT NUMBER:
DOUGLAS W OUNANIAN
TITLE:
CONTINUOUS TUNNEL LINING FOR DEEP BASING
TOPIC# 243 OFFICE: BMO/MYSC

DEEP BASING FACILITIES MUST BE CONSTRUCTED TO RESIST HIGH LOADS, THEREFORE THE LINING STRUCTURE MUST EXHIBIT BOTH COMPLIANCE AND

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TOUGHNESS TO MAINTAIN ITS INTEGRITY. CURRENT CAST-IN-PLACE AND PRE-CAST LINING SYSTEMS COUPLED WITH THE INSTALLATION OF A SEPARATE, ENERGY-ABSORBING BACKPACKING LAYER ARE EXPENSIVE TO INSTALL, ARE LABOR INTENSIVE, AND ARE NOT LIKELY TO ACHIEVE THE 25 FT/HR ADVANCE RATE GOAL. TO OVERCOME THE DEFICIENCIES OF THE CURRENT TECHNOLOGY A NEW LINING SYSTEM WILL BE DEVELOPED WHICH WILL CONTINUOUSLY SLIPFORM A TWO-LAYER COMPOSITE LINING DIRECTLY BEHIND A TUNNEL BORING MACHINE AT ADVANCE RATES OF AT LEAST 25 FT/HR. IN PREVIOUS SLIPFORM DEVELOPMENT WORK, ADVANCE RATE WAS LIMITED BY HIGH DRAG FORCES; HOWEVER, DURING PHASE I IT WAS SHOWN ANALYTICALLY AND EXPERIMENTALLY THAT SLIPFORM DRAG IS SIGNIFICANTLY REDUCED WHEN CASTING A TWO-LAYER SYSTEM. LOW DRAG ALLOWS THE USE OF A SIMPLE FORM WHICH CAN BE SELF-ADVANCED USING ONLY THE FORCE APPLIED BY THE CONCRETE PUMP, THEREFORE, NO CONNECTION TO THE TBM IS REQUIRED. THE PRIMARY GOALS OF THE PHASE II EFFORT ARE TO DEVELOP AND TEST A PROTOTYPE OF THE SLIPFORMING CONCEPT IN THE FULL ROUND CONFIGURATION, AND TO DEVELOP AN OVERALL SYSTEM DESIGN SPECIFICALLY ADDRESSING THE DEEP BASE TUNNEL CONSTRUCTION REQUIREMENTS.

FOSTER-MILLER INC AF
350 SECOND AVE
WALTHAM, MA 02254
CONTRACT NUMBER: FQ8671-8601307
DR MARK A DRUY
TITLE:
ORDERED POLYMER NONLINEAR OPTICAL MATERIALS
TOPIC# 4 OFFICE: AFOSR/XOT

ORGANIC POLYMER MATERIALS WITH HIGHLY CONJUGATED PI ELECTRON SYSTEMS EXHIBIT POTENTIALLY USEFUL THIRD ORDER NONLINEAR OPTICAL (NLO) PROPERTIES. ORDERED POLYMERS, IN PARTICULAR, POLY-P PHENYLENE BENZOBISTHIAZOLE (PBT), HAVE A HIGHER LASER DAMAGE THRESHOLD AND A VALUE OF X(3) ABOUT ON THE ORDER OF MAGNITUDE HIGHER THAN THAT OF CS(2). PBT ALSO POSSESSES EXCEPTIONAL ENVIRONMENTAL STABILITY, EXCELLENT MECHANICAL PROPERTIES, AND LIQUID CRYSTALLINE ORDER WHICH ALLOWS FOR THE POSSIBILITY OF MATCHING THE ELECTRIC FIELD DIRECTION TO THE ORIENTATION OF THE POLYMER. ALL THESE CHARACTERISTICS WARRANT CONTINUED DEVELOPMENT OF ORDERED POLYMERS AS POTENTIAL NONLINEAR OPTICAL MATERIALS. THE PHASE I EFFORT DETERMINED THAT BY VARYING THE PROCESS CONDITIONS OF PBT, ONE COULD ALTER THE VALUE OF X(3) (THIRD

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ORDER NONLINEAR SUSCEPTIBILITY). AS A RESULT OF THE PHASE I EFFORT, A NOVEL THIN FILM DEPOSITION PROCESS WAS DEVELOPED FOR THE PBT WHICH OFFERS THE POTENTIAL OF PRODUCING FILMS OF IMPROVED OPTICAL QUALITY. THUS, THE PHASE II PROGRAM WILL ADDRESS THE FOLLOWING ISSUES: CONTINUED DEVELOPMENT OF ORDERED POLYMER PROCESSING TO IMPROVE OPTICAL TRANSPARENCY AND OPTICAL FLATNESS, AND MODIFICATION OF THE PBT BACKBONE TO ENHANCE THE VALUE OF X(3). MEETING THESE OBJECTIVES WILL EXPAND THE TECHNOLOGY BASE FOR ORDERED POLYMER APPLICATIONS.

FOSTER-MILLER INC NAVY
350 SECOND AVE
WALTHAM, MA 02254
CONTRACT NUMBER:
RICHARD LUSIGNEA
TITLE:
PHOTODEPOSITON OF FINE LINE COPPER CONDUCTORS FOR HIGH DENSITY MULTILAYER PRINTED WIRING BOARDS
TOPIC# 129 OFFICE: NWC/SSPO

A NOVEL, FULLY ADDITIVE PROCESS EMPLOYING NEW PERMANENT PHOTOPROCESSABLE DIELECTRIC MATERIALS AND IMPROVED ELECTROLESS PLATING TECHNIQUES WILL PROVIDE MAJOR IMPROVEMENTS IN HIGH DENSITY MULTILAYER PRINTED WIRING BOARD (PWB) ELECTRONIC INTERCONNECT PACKAGES. THE PHASE I PROGRAM DEMONSTRATED THE FEASIBILITY OF FABRICATING FINE LINE MULTILAYER BOARDS (MLB'S) HAVING COPPER CONDUCTORS 2 MIL WIDE ON 2 MIL SPACES WITH EQUALLY SMALL DIAMETER VIAS. THIS REPRESENTS BETTER THAN A 100 PERCENT IMPROVEMENT OVER EXISTING MLB TECHNOLOGY AND WOULD ANSWER MANY OF THE INTERCONNECT CHALLENGES POSED BY THE IMPROVEMENTS IN VERY LARGE SCALE INTEGRATED CIRCUITS (VLSIC) AND THE DEVELOPMENT OF VERY HIGH SPEED INTEGRATED CIRCUITS (VHSIC) COUPLED WITH THE SHIFT TO DIRECT SURFACE MOUNTING (DSM) OF LEADLESS CERAMIC CHIP CARRIERS. THE PROPOSED PHASE II PROGRAM WILL DEFINE THE VARIOUS PROCESS PROTOCOLS REQUIRED TO IMPLEMENT THIS NEW ADDITIVE TECHNOLOGY AND WILL PRODUCE A NUMBER OF FUNCTIONAL PROTOTYPE MLB'S WHICH CAN BE TESTED FOR ELECTRICAL AND MECHANICAL PERFORMANCE. THE PHASE II WORK WILL DEMONSTRATE THE ADVANTAGES OF THIS TECHNIQUE OVER OTHER APPROACHES SUCH AS WAFER SCALE INTEGRATION OR THIN FILM MULTICHIP SUBSTRATE PACKAGES FOR ULTRA-HIGH DENSITY INTERCONNECT PACKAGES. ALL MAJOR PROCESS PARAMETERS WILL BE CLEARLY DEFINED ALLOWING FOR RAPID SCALE-UP AND COMMERCIALIZATION IN PHASE III.

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FOSTER-MILLER INC NAVY
350 SECOND AVE
WALTHAM, MA 02254
CONTRACT NUMBER:
RICHARD W LUSIGNEA
TITLE:
LIQUID CRYSTAL POLYMERS FOR ADVANCED INTERCONNECT SUBSTRATES
TOPIC# 137 OFFICE: NWSC/SSPO

THE PHASE I PROGRAM SHOWES THAT LIQUID CRYSTAL POLYMERS (LCPs) SUCH AS XYDAR AND VECTRA WILL PROVIDE SIGNIFICANT IMPROVEMENTS IN THE PERFORMANCE AND MANUFACTURE OF HIGH SPEED, HIGH DENSITY ELECTRONIC SYSTEMS. MULTILAYER BOARDS (MLBs) MADE FROM LCPs WILL BE EASIER TO FABRICATE THAN CERAMIC MLBs AND WILL HAVE MUCH LOWER DIELECTRIC CONSTANT (LESS THAN 3.0) FOR BETTER RELIABILITY AND FASTER CLOCK SPEED. LCP FILMS ARE STRONG AND TOUGH WITHOUT THE NEED FOR FIBER REINFORCEMENT AND WITHOUT THE ASSOCIATED PROBLEMS. ALSO, LCP FILMS ARE THINNER (LESS THAN 0.002 IN.) THAN FIBER REINFORCED SUBSTRATES, RESULTING IN SMALLER, MORE DENSELY PACKED ELECTRONIC DEVICES. FOSTER-MILLER PROPRIETARY FILM PROCESSING TECHNOLOGY SUCCESSFULLY CONTROLLED THE COEFFICIENT OF THERMAL EXPANSION (CTE) THROUGH POLYMER ORIENTATION, ALLOWING THE CTE OF THE LCP SUBSTRATE TO BE MATCHED TO ALUMINA CHIP CARRIERS (3 TO 7 ppm/[o]C). LCPs ARE USABLE AT TEMPERATURES OVER 600 DEG F FOR PROCESSING AND SERVICE. THIS LCPs PROVIDE THE PERFORMANCE OF FIBER-REINFORCED RESINS BUT WITHOUT THE DRAWBACKS SUCH AS MICROCRACKING AND RAPID DRILL BIT WEAR. THE PROPOSED PHASE II PROGRAM WILL CONCENTRATE ON SELECTING AND REFINING THE BEST LCP MATERIALS AND PROCESSES FOR MLB SUBSTRATES, VERIFYING PROPERTIES AND DEMONSTRATING PERFORMANCE ON PROTOTYPE MLBs.

FOSTER-MILLER INC/CICCONE V J & ASSOCS) ARMY
14045 JEFFERSON DAVIS HWY
WOODBRIDGE, VA 22191
CONTRACT NUMBER:
LESLIE S RUBIN
TITLE:
DEVELOPMENT OF AN INTEGRATED SANDY BEACH/ROCKY COAST SEASIDE INTAKE SYSTEM FOR ROWPU'S
TOPIC# 104 OFFICE: BRDC

SUBMITTED BY DEPT

THE OBJECTIVE OF THIS PROPOSED PHASE II PROGRAM IS TO COMBINE TWO INDEPENDENTLY DEVELOPED PHASE I FEASIBILITY PROTOTYPE SYSTEMS INTO A SINGLE PACKAGE THAT PROVIDES OPERATING CAPABILITIES AT BOTH SANDY AND ROCKY COASTLINES. THE PART A SANDY COASTLINE SYSTEM IS A RECOVERABLE SHALLOW WELL MANUALLY INSTALLED IN THE BEACH AREA ABOVE TIDE LEVEL. A SUBMERSIBLE PUMP IN THE WELL, PROTECTED FROM SURF AND TIDE ACTION, CONTINUOUSLY PUMPS CLEAR SEAWATER TO A SHORE LOCATION. THE PART B ROCKY COASTLINE SYSTEM IS DEPLOYABLE AND RETRIEVABLE FROM THE SHORE AND WILL USE A SUBMERSIBLE INTAKE PUMP TO ELIMINATE SUCTION INLET HOSE PROBLEMS AND TO ALLOW INTAKE PLACEMENT IN SUFFICIENTLY DEEP WATER TO ACCOMMODATE TIDAL CHANGES. THIS PROPOSED PHASE II PROGRAM WILL RESULT IN THE DESIGN, FABRICATION AND OCEANSIDE TESTING OF A FULLY INTEGRATED SEASIDE INTAKE SYSTEM DESIGNED TO MAXIMIZE COMMONALITY OF EQUIPMENT, MAXIMIZE EQUIPMENT INTEGRATION AND MINIMIZE WEIGHT AND SIZE OF THE TOTAL PACKAGE WHILE PROVIDING SIMPLISTIC OPERATION.

FRONTIER TECHNOLOGY INC AF
5266 HOLLISTER AVE - STE 215
SANTA BARBARA, CA 93111
CONTRACT NUMBER: F33657-86-C-2215
EDWARD P JORDAN
TITLE:
STRATEGIC PLANNING INNOVATIONS FOR ASD/XR
TOPIC# 94 OFFICE: ASD/XR

THE OVERALL OBJECTIVE FOR PHASE I AND II IS TO DEVELOP AND IMPLEMENT AN INNOVATIVE STRATEGIC PLANNING PROCESS FOR THE DEPUTY FOR DEVELOPMENT PLANNING, AERONAUTICAL SYSTEMS DIVISION (ASD/XR), WHICH WILL UNIFY AND INTEGRATE THE DEVELOPMENT PLANNING ACTIVITIES OF THAT ORGANIZATION. IN PHASE III, FRONTIER WILL ADAPT THE METHODS, PROCESSES, TECHNIQUES, AND LEARNING DEVELOPED IN PHASE I/II TO OTHER GOVERNMENT AND INDUSTRIAL AGENCIES WHICH ARE INVOLVED IN PLANNING THE DEVELOPMENT OF AEROSPACE SYSTEMS. DURING PHASE I, ELEMENTS OF PLANNING AND PLANNING FUNCTIONS WERE ANALYZED IN A GENERIC CONTEXT AND THEN APPLIED TO DEVELOPMENT PLANNING FOR AIR FORCE WEAPON SYSTEMS. DEVELOPMENT PLANNING PRACTICES, INTERFACES, AND REQUIREMENTS IN ASD/XR AND OTHER ASD AGENCIES WERE EXAMINED THROUGH DOCUMENTATION RESEARCH AND EXTENSIVE INTERVIEWS. A UNIFIED PLANNING PROCESS WAS DEVELOPED AND SPECIFIC RECOMMENDATIONS MADE FOR ITS IMPLEMENTATION. IT IS CORRELATED WITH THE AFSC VANGUARD PROCESS, BUT ALSO SATISFIES

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DEVELOPMENT PLANNING NEEDS AND OBJECTIVES AT THE PRODUCT-DIVISION LEVEL. IN PHASE II, PROCESS DETAILS WILL BE REFINED. MAJOR STEPS AND PRODUCTS OF THE PROCESS WILL BE DEMONSTRATED AND GUIDANCE PROVIDED FOR CONTINUING IMPLEMENTATION OF THE PROCESS WITHIN ASD/XR.

GENERAL SCIENCES INC AF
655 S GRAVERS RD
PLYMOUTH MEETING, PA 19462
CONTRACT NUMBER:
DONALD E NESTLER
TITLE:
WAKE SIGNATURE REDUCTION BY ADVANCED CONCEPTS
TOPIC# 261 OFFICE: BMO/MYSC

AN EVALUATION OF ADVANCED CONCEPTS TO REDUCE RE-ENTRY VEHICLE WAKE RADAR SIGNATURE (AND EVENTUALLY DEFEAT DISCRIMINATION BASED ON RADAR DOPPLER) IS PROPOSED, BASED ON PROMISING RESULTS OBTAINED IN OUR PHASE I STUDY. THE PROPOSED PROGRAM CONSISTS OF EXPERIMENTAL STUDIES SUPPLEMENTED BY ANALYSIS. THE EXPERIMENTAL PHASE CONSISTS OF LABORATORY EXPERIMENTS TO MEASURE QUENCHING EFFECTIVENESS OF SEVERAL CANDIDATE MATERIALS, PLASMA ARC TESTS TO DETERMINE THE INTERACTIVE EFFECTS OF QUENCHANTS AND ABLATORS, AND BALLISTICS RANGE TESTS TO MEASURE WAKE RCS REDUCTION WITH A CLOSER SIMULATION OF RE-ENTRY CONDITIONS. THE ANALYTICAL STUDIES FEATURE THE APPLICATION OF ADVANCED RE-ENTRY BODY AND WAKE FLOW FIELD CODES, INCLUDING NON-EQUILIBRIUM THERMOCHEMISTRY, TO PREDICT THE EFFECT OF VARIOUS QUENCHANTS ON WAKE ELECTRON DENSITY AND RCS FOR A REPRESENTATIVE RE-ENTRY VEHICLE. THE GOAL OF THE PROGRAM IS TO IDENTIFY AND CHARACTERIZE HIGHLY EFFECTIVE, PRACTICAL QUENCHANT MATERIALS THAT CAN BE FLIGHT-TESTED IN A FOLLOW-ON PROGRAM.

GENERAL TECHNOLOGY APPLICATIONS INC AF
12343-D SUNRISE VALLEY DR
RESTON, VA 22091
CONTRACT NUMBER:
DR ALBERT F HADERMANN
TITLE:
DEMONSTRATION OF LOW COST BINDERS FOR LARGE SOLID ROCKET MOTORS
TOPIC# 80 OFFICE: AFRPL/TSTR

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THE U.S. AIR FORCE IS SEEKING TO REDUCE THE COST OF SOLID ROCKET MOTORS, PARTICULARLY LARGE UNITS. COST SAVINGS ARE POSSIBLE BOTH IN PROCESSING TECHNIQUES AND IN MATERIALS. IN THE PHASE I SBIR PROGRAM, GTA UTILIZED ITS PILOT PLANT PROCESSING EQUIPMENT TO DEMONSTRATE THE FEASIBILITY OF THE CONCEPT OF CONTINUOUS PROCESSING. GTA PROPOSES IN PHASE II TO CONTINUE THIS WORK FOCUSING ON UTILIZATION OF LOWER COST BINDER MATERIALS, IN PARTICULAR THERMOPLASTIC ELASTOMERS (TPE). GTA PROCESSING TECHNIQUES EMPLOY NEW CONDITIONS WHEREIN LIQUIDS AND SOLIDS CAN BE INTIMATELY BLENDED AND MIXED WITHOUT CHEMICAL REACTION OR PHYSICAL INTERACTION. UTILIZING THESE PROCESSES, BINDER SYSTEMS CAN BE USED WHICH COULD NOT BE PROCESSED WITH CONVENTIONAL TECHNIQUES. THE PROPOSED PHASE II PROGRAM WILL INVESTIGATE NEW LOWER COST BINDERS, SUCH AS TPE'S WHICH, THROUGH NEW PROCESSING TECHNIQUES COULD MEET THE DESIRED U.S. AIR FORCE PERFORMANCE SPECIFICATIONS.

GEO-CENTERS INC ARMY
7 WELLS AVE
NEWTON CENTRE, MA 02159
CONTRACT NUMBER:
EDWARD D PETROW
TITLE:
NEW SYNTHETIC ROUTES FOR ENERGETIC MATERIALS
TOPIC# 4 OFFICE: ARDEC/SMCAR

THE THEORETICAL CALCULATIONS AND PRELIMINARY TESTS ON THE HIGHLY STRAINED CAGE COMPOUNDS SUCCESSFULLY SYNTHESIZED DURING THE PHASE I EFFORT STRONGLY INDICATE THAT THESE MATERIALS POSSESS THE BASIC INGREDIENTS FOR A TOTALLY NEW CLASS OF ENERGETIC MATERIAL WHOSE PERFORMANCE AND INSENSITIVITY WILL EXCEED THAT OF HMX. SIGNIFICANT AMONG THESE QUALITIES ARE HIGH DENSITY (>2.0 G/CC), HIGH-ENERGY CONTENT (STOICHIOMETRIC), AND HIGH CHEMICAL/THERMAL/MECHANICAL STABILITY. AS A RESULT OF SYNTHETIC STUDIES PERFORMED DURING PHASE I, SCALE-UP SYNTHESES OF THE FOLLOWING TARGET MOLECULES IS PROPOSED FOR PHASE II: 1) 1,2,3,4-TETRANITROCUBANE, 2) HEXANITRO AND OCTANITRO PENTACYCLOUNDECANE, 3) TETRANITROPENTACYCLOUNDECANE. CAGE MOLECULES AND CONCURRENT NITRO SUBSTITUTION WILL BE ACHIEVED BY USE OF READILY AVAILABLE PRECURSOR MATERIALS SUCH AS 1,3-DICARBOXYCUBANE, SUBSTITUTED P-BENZOQUINONES AND CYCLOPENTADIENES. NOVEL DIMERIZATION TECHNIQUES WITH SUBSTITUTED ACETYLENES WILL ALSO BE USED TO BUILD THE TARGETED NITRO CAGE MOLECULES IN QUANTITY.

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GEO-CENTERS INC DNA
PO BOX 428
NEWTON UPPER FALL, MA 02159
CONTRACT NUMBER: DNA87-C-0279
THOMAS G DIGIUSEPPE
TITLE:
HIGH PRESSURE FIBER OPTIC SENSOR FOR NUCLEAR TEST INSTRUMENTATION
TOPIC# 3 OFFICE: AM

THE GOAL OF THE PHASE II PROGRAM IS TO DEVELOP A FIBER OPTIC BASED VERY HIGH PRESSURE MEASUREMENT SYSTEM FOR USE AT THE NEVADA TEST SITE. CURRENTLY, PIEZO-ELECTRIC AND PIEZO-RESISTIVE GAUGES ARE TYPICALLY USED. AS THESE SENSORS ARE ELECTRONIC IN NATURE, THEY ARE ADVERSELY AFFECTED BY ELECTROMAGNETIC INTERFERENCE (EMI) WHICH IS CREATED IN A NUCLEAR EVENT. THE PROPOSED FIBER OPTIC SENSOR WHICH IS BASED ON THE PHOTOELASTIC EFFECT IS INHERENTLY IMMUNE TO THE EFFECTS OF EMI. IN ADDITION, THE PROPOSED SENSOR IS IMMEDIATELY COMPATIBLE WITH THE FIBER OPTIC DATA TRANSMISSION LINES WHICH ARE PRESENTLY UTILIZED IN UNDERGROUND NUCLEAR TESTS. THE INCORPORATION OF A SUM-DIFFERENCE SENSOR OUTPUT DETECTION SCHEME RESULTS IN A SENSOR WHICH IS INSENSITIVE TO THE EFFECTS OF RADIATION FIBER DARKENING. SENSOR MEASUREMENT CAPABILITIES INCLUDE A LINEAR PRESSURE SENSING RANGE IN EXCESS OF 5 kBAR AND A MEASUREMENT BANDWIDTH CAPABILITY OF 1 MHz. DURING THE PHASE II EFFORT, FIBER OPTIC VERY HIGH PRESSURE SENSORS WILL BE DESIGNED, FABRICATED AND FIELD TESTED AT THE FACILITIES WHICH INCLUDE THE NEVADA TEST SITE.

GLOBAL INFORMATION SYSTEMS TECH INC ARMY
1800 WOODFIELD DR
SAVOY, IL 61874
CONTRACT NUMBER:
DR THOMAS T CHEN
TITLE:
BUILDING A GENERIC INTELLIGENT TUTOR
TOPIC# 112 OFFICE: MICOM

DURING PHASE I OF THIS RESEARCH, GIST BUILT AND DEMONSTRATED AN

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INTELLIGENT TUTORING SYSTEM PROTOTYPE THAT IMPLEMENTED MASTERY INSTRUCTION IN SIMULATION TRAINING. DOMAIN AND INSTRUCTIONAL KNOWLEDGE WERE REPRESENTED SEPARATELY IN THE SYSTEM; THEY COMMUNICATED THROUGH A GENERIC INTERFACE CALLED AN INSTRUCTIONAL CALCULUS MODEL. AN EXPERT TEACHER MODEL IMPLEMENTED DIRECT INSTRUCTION STRATEGIES (ENGELMAN & CARNINE, 1982) THAT HAVE BEEN USED IN NUMEROUS COMPUTER-BASED LESSONS. DURING PHASE II OF THIS RESEARCH, WE WILL ANALYZE ACTUAL SIMULATIONS THAT HAVE BEEN DESIGNED FOR A HIGH-TECHNOLOGY WEAPON SYSTEM. WE WILL DESIGN AND IMPLEMENT AN EXPERT TEACHER MODEL THAT TEACHES THE SIMULATIONS TO MASTERY. THIS WILL ALLOW WEAPON SYSTEMS OPERATORS TO PRACTICE AND MAINTAIN THEIR SKILL LEVELS IN THE FIELD.

GORDON ASSOCS NAVY
236 ANDOVER ST
WILMINGTON, MA 01887
CONTRACT NUMBER:
STANLEY H GORDON
TITLE:
A NEW FIELD SYSTEM FOR DETACHING AND REMOUNTING SMD'S
TOPIC# 138 OFFICE: NSWC/SSPO

A NEW SYSTEM FOR REPAIR OF HIGH-DENSITY, SURFACE-MOUNTED DEVICES WAS DEVELOPED AND DEMONSTRATED IN PHASE I OF THIS SBIR PROGRAM. THE SYSTEM PROVIDES A NON-CONTACT MEANS OF HEATING SOLDER PADS AND TERMINALS THROUGH THE USE OF FOCUSED INFRARED ENERGY. THIS PROPOSAL FOR THE PHASE II CONTINUATION OF THE PROGRAM CALLS FOR REFINEMENT AND SEMI-AUTOMATION OF THE PHASE I EQUIPMENT, AND THE DEVELOPMENT OF SEVERAL ADDITIONAL FEATURES WHICH ARE DEEMED DESIRABLE. AMONG THESE ARE A SEMI-AUTOMATIC PARTS-HANDLING SYSTEM, A PRE-HEAT SYSTEM FOR SUBSTRATES, AND POSITIVE CONTROL OF THE TEMPERATURE OF THE SMD SOLDER LEADS UNDER REPAIR THROUGH FEEDBACK. PROVISIONS FOR APPLICATION OF THE EQUIPMENT TO COMMERCIAL USE WILL ALSO BE PURSUED.

GREEN MOUNTAIN RADIO RESEARCH CO ARMY
50 VERMONT AVE - FT ETHAN ALLEN
WINOOSKI, VT 05404
CONTRACT NUMBER:
FREDERICK H RAAB
TITLE:
EXPERIMENTAL ADAPTIVE-JAMMER POWER-AMPLIFIER SYSTEM
TOPIC# 55 OFFICE: CECOM/AMSEL

SUBMITTED BY DEPT

THE PROPOSED PROGRAM IS A FEASIBILITY STUDY AND SYSTEM DESIGN FOR AN INNOVATIVE POWER-AMPLIFIER SYSTEM FOR THE ADAPTIVE-JAMMER APPLICATION. THIS SYSTEM OPERATES OVER THE ENTIRE HF AND VHF RANGE (3 - 300 MHz), PRODUCES SIGNALS WITH VARIOUS TYPES OF MODULATION, AND CAN CONCENTRATE ALL OF ITS POWER ON A SINGLE TARGET OR DIVIDE ITS POWER AMONG SEVERAL TARGETS. ITS POWER AMPLIFIERS CAN BE OPERATED IN CLASS B TO PRODUCE A CLEAN, WIDEBAND OUTPUT OR IN CLASS D TO PRODUCE GREATER POWER WITH GREATER EFFICIENCY WHEN HIGHER LEVELS OF HARMONICS, IMD, AND SPURIOUS PRODUCTS ARE ALLOWABLE. THE SYSTEM IS BASED UPON WIDEBAND, MULTIMODE PA MODULES, ENVELOPE ELIMINATION AND RESTORATION, HIGH-EFFICIENCY CLASS-S MODULATORS, WIDEBAND AMPLITUDE MODULATION BY OUTPHASING, HARMONIC CANCELLATION, AND BANKS OF PIN-DIODE-SWITCHED FILTERS FOR EACH PA MODULE. CONTROL OF THE SYSTEM IS VESTED IN A PERSONAL COMPUTER THAT COMMUNICATES WITH THE HARDWARE THROUGH AN IEEE-488 INTERFACE.

GREENBRIAR SYSTEMS INC NAVY
8150 LEESBURG PIKE - STE 407
VIENNA, VA 22180
CONTRACT NUMBER: N00039-88-C-
DIXON CLEVELAND
TITLE:
INFORMATION FEEDBACK CONTROL FOR DIRECTING STEERABLE ESM ANTENNAS
TOPIC# 31 OFFICE: SPAWAR

GREENBRIAR SYSTEMS' SBIR PROJECT ADDRESSES ELINT/ESM INFORMATION PROCESSING RESEARCH FOR REAL-TIME DETECTION, CHARACTERIZATION, IDENTIFICATION, AND LOCATION OF RADAR EMITTERS ON A BATTLEFIELD. GIVEN THE PREDICTED GROWTH OF PULSE DENSITIES IN THE ELECTRONIC ENVIRONMENT, AND THE PROLIFERATION OF AGILE RADARS FURTHER COMPLICATING THE SPECTRAL COMPOSITION IT BECOMES NECESSARY TO APPLY STATE-OF-THE-ART PROCESSING TECHNOLOGY WITHOUT INCURRING SIZE OR WEIGHT PENALTIES IN THE ELINT/ESM EQUIPMENT. FROM THE VIEWPOINT OF INFORMATION PROCESSING, IT IS DESIRABLE TO OBTAIN MORE USEFUL ELECTRONIC ORDER OF BATTLE INFORMATION FOR LESS COMPUTATIONAL WORK OR WITH LESS EQUIPMENT; THAT IS, TO OBTAIN MORE ACCURATE, COMPLETE, AND RELEVANT INFORMATION ABOUT A COMPLEX EMITTER ENVIRONMENT WHILE MAINTAINING OR REDUCING THE COMPLEXITY OF THE PROCESSING EQUIPMENT. THE OBJECTIVE OF AN ADVANCED ESM SYSTEM, THEREFORE, IT TO SYNTHESIZE, FROM

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MEASUREMENTS MADE ON ENEMY RADAR TRANSMISSIONS, A COMPLETE, ACCURATE, AND UP-TO-DATE REPRESENTATION OF A SPECIFIED SEGMENT OF THE ENEMY'S EOB. IN PHASE I, IT WAS DEMONSTRATED THAT THE USE OF INFORMATION FEEDBACK CONTROL CAN SIGNIFICANTLY IMPROVE THE QUALITY OF EOB INFORMATION WITHOUT INCREASING THE COMPLEXITY OF THE HARDWARE. THE PURPOSE OF PHASE II IS TO COMPLETE THE DEVELOPMENT OF INFORMATION-BASED PROCESSING ALGORITHMS.

HARTMANN RESEARCH ARMY
5419 RIDGEDALE DR
DALLAS, TX 75206
CONTRACT NUMBER:
CLINTON S HARTMANN
TITLE:
LOW LOSS SAW FILTERS USING MONOLITHIC CONSTRUCTION
TOPIC# 83 OFFICE: LABCOM/ETDL

THE PHASE I PROGRAM DEMONSTRATED FEASIBILITY OF AN INNOVATIVE NEW LOW LOSS SAW TRANSDUCER STRUCTURE, THE ELECTRODE WIDTH CONTROLLED SINGLE PHASE UNIDIRECTIONAL TRANSDUCER (EWC/SPUDT). THIS MONOLITHIC TRANSDUCER OVERCOMES THE LIMITATIONS OF PREVIOUS LOW LOSS SAW FILTERS WHICH WILL GREATLY EXPAND ITS POTENTIAL USES IN MILITARY AND COMMERCIAL SYSTEMS. THE PHASE II PROGRAM WILL CONCENTRATE ON ACCURATELY MEASURING THE PROPERTIES OF THE EWC/SPUDT SO THAT ACCURATE FILTER SYNTHESIS IS POSSIBLE. ALSO, FILTER SYNTHESIS TECHNIQUES WILL BE DEVELOPED AND DEMONSTRATED BY DESIGNING A LOW LOSS 300 MHz BANDPASS FILTER.

HAWAII BIOTECHNOLOGY GP INC ARMY
99-193 AIEA HEI TS DR
AIEA, HI 96701
CONTRACT NUMBER:
DR JOHN M IVY
TITLE:
DEVELOPMENT OF A DENGUE VACCINE
TOPIC# 209 OFFICE: AMRDC/SGRD

DENGUE VIRUS IS A POSITIVE SENSE, SINGLE STRANDED RNA VIRUS TRANSMITTED TO MAN BY MOSQUITOS. TOWARD DEVELOPING A VACCINE FOR

SUBMITTED BY DEPT

DENGUE TYPE 2 VIRUS, A LIBRARY OF RANDOMLY PRIMED cDNA FRAGMENTS REPRESENTING THE DENGUE RNA GENOME HAS BEEN CLONED IN THE BACTERIOPHAGE EXPRESSION VECTOR LAMBDA/gt11. INSERT FRAGMENT SIZES AVERAGE ABOVE 100 BASE PAIRS, WHICH IS SUFFICIENT TO ENCODE 33 AMINO ACID RESIDUES AS A PEPTIDE FUSED TO BETA- GALACTOSIDASE. WE PROPOSE TO SCREEN THE LIBRARY WITH HUMAN CONVALESCENT ANTISERA FOR RECOMBINANTS EXPRESSING DENGUE ANTIGENS. THE DNA SEQUENCE OF THE RECOMBINANTS WILL BE DETERMINED, AND THE CORRESPONDING FUSION PROTEINS AFTER PURIFICATION WILL BE USED TO ELICIT ANTISERA. THE ELICITED ANTIBODIES THEN WILL BE TESTED FOR HEMAGGLUTINE-TION-INHIBITING AND DENGUE VIRUS NEUTRALIZING ACTIVITY. IN THIS MANNER, WE WILL BE ABLE TO IDENTIFY AND CHARACTERIZE DENGUE PEPTIDES AND THEIR CORRESPONDING SEQUENCES THAT ARE CANDIDATES FOR VACCINES.

HAWAII BIOTECHNOLOGY GP INC ARMY
99-193 AIEA HEIGHTS DR
AIEA, HI 96701
CONTRACT NUMBER:
DR NAVZER D SACHINVALA
TITLE:
TETRODOTOXIN IMMUNOASSAYS
TOPIC# 210 OFFICE: AMRDC/SGRD

TETRODOTOXIN IS A HIGHLY POTENT LOW MOLECULAR WEIGHT NEUROTOXIN FOUND IN SOME SPECIES OF PUFFER FISH AND A FEW OTHER WIDELY DIVERGENT ORGANISMS. CURRENTLY, TETRODOTOXIN IS MEASURED BY MOUSE BIOASSAY OR WITH SOPHISTICATED CHROMATOGRAPHIC METHODS. A SIMPLE, SPECIFIC, EASY TO USE METHOD, SUCH AS AN IMMUNOASSAY FOR TETRODOTOXIN IS NEEDED. TO DATE, NO IMMUNOASSAY FOR TETRODOTOXIN EXISTS, PRESUMABLY BECAUSE OF DIFFICULTIES ASSOCIATED WITH THE CHEMISTRY OF TETRODOTOXIN. WE HAVE SYNTHESIZED TWO DERIVATIVE OF TETRODOTOXIN WHICH MAY NOW BE USED AS HAPTENS FOR THE PRODUCTION OF ANTI-TETRODOTOXIN ANTIBODIES. PHASE II FOCUSES ON THE PROBLEM OF GENERATING A RELIABLE IMMUNOASSAY FOR TETRODOTOXIN. SUCH AN ASSAY COULD FILL THE NEED TO DETECT TETRODOTOXIN IN A WIDE VARIETY OF BIOLOGICAL MATRICES.

HERSH ACOUSTICAL ENGINEERING INC AF
9545 COZYCROFT AVE
CHATSWORTH, CA 91311
CONTRACT NUMBER:
ALAN S HERSH
TITLE:
DEVELOPMENT OF A DYNAMIC FEEDBACK SYSTEM TO CONTROL INSTABILITIES WITHIN LIQUID ROCKET ENGINES
TOPIC# 76 OFFICE: AFRPL/TSTR

SUBMITTED BY DEPT

A RESEARCH PROGRAM IS PROPOSED TO DEVELOP A FEEDBACK SYSTEM TO CONTROL INSTABILITIES WITHIN LIQUID ROCKET ENGINES. THE RESEARCH EFFORT IS DIVIDED INTO THREE PARTS. FIRST, A CONTROL SYSTEM WILL BE DESIGNED TO DYNAMICALLY VARY THE IMPEDANCE OF A HELMHOLTZ RESONATOR--AT OFF-TUNED FREQUENCIES--TO EFFICIENTLY ABSORB THE ENERGY OF UNSTABLE SOUND WAVES. SECOND, A SIGNAL PROCESSING ALGORITHM WILL BE DEVELOPED TO RAPIDLY DETECT AND TRACK THE ONSET OF UNSTABLE ACOUSTIC WAVES EMBEDDED WITH LOCALLY INTENSE, COMBUSTION GENERATED TURBULENT BOUNDARY-LAYER NOISE. THIRD, THE DYNAMIC CONTROL AND SIGNAL PROCESSING SYSTEMS WILL BE VERIFIED BY USING THEM TO CONTROL THE "SOMGOMG - FLAME" COMBUSTION TONES GENERATED WITHIN A RIJKE TUBE.

HODGES COMPUTER RESEARCH CORP NAVY
1588 BATAUIA
ORANGE, CA 92667
CONTRACT NUMBER:
WILLIAM DARNELL
TITLE:
DEVELOPMENT OF HIGH LEVEL LANGUAGE ENGINE/CONTROLLER FOR ROBOTICS AND FLEXIBLE FACTORY AUTOMATION APPLICATIONS
TOPIC# 120 OFFICE: NSWC/SSPO

THIS PROPOSAL ADDRESSES THE ARCHITECTURE, FUNCTIONAL TOP LEVEL CONTROL, SYSTEM STATUS AND CONTROL, PROGRAM EXECUTION CONTROL, INSTRUCTION LOAD CONTROL, DATA CONTROL, COMMUNICATIONS CONTROL, LAYERED PROCESSORS, PIXEL PROCESSORS, DIRECT EXECUTION OF HIGH LEVEL LANGUAGE, DOWN LOADABLE MICROCODE, APLICABILITY TO ROBOTICS AND FACTORY AUTOMATION, IMPLEMENTATION IN VME ENVIRONMENT, VLSI IMAGE PROCESSING, VERTICAL COMMUNICATIONS, FORTH ENGINE HIGH LEVEL LANGUAGE CONSIDERATIONS AND IMAGE PROCESSING. END RESULT WOULD BE A DEMONSTRATION OF A SUBSYSTEM USING NSWC EQUIPMENT, ACCESSED VIA VME BUS TO SHOW IMAGE PROCESSING WITH PARALLEL PIXEL PROCESSING IN A MULTI PLANAR ARCHITECTURE. OUTPUT VIA IBM OR NU BUS WILL ALSO BE POSSIBLE.

HOKENSON CO AF
840 S TREMAINE AVE
LOS ANGELES, CA 90005
CONTRACT NUMBER: F08635-88-C-0083
DR GUSTAVE J HOKENSON
TITLE:
DRAG REDUCTION ON 20MM AIRCRAFT CANNON PROJECTILES UTILIZING BASE BLEED FROM A SOLID WAFER ADD-ON
TOPIC# 35 OFFICE: AFATL/MNG

SUBMITTED BY DEPT

A COMPREHENSIVE EXPERIMENTAL AND NUMERICAL STUDY OF DRAG REDUCTION OF 20mm AIRCRAFT CANNON PROJECTILES UTILIZING BASE BLEED SHALL BE CARRIED OUT UTILIZING OUR SOLID WAFER ADD-ON CONCEPT. THE EXPERIMENTAL STUDY SHALL CONSIST OF AN EXTENSIVE SERIES OF FLIGHT TESTS IN WHICH THE VELOCITY DECAY SHALL BE MEASURED FOR PROJECTILES WITH AND WITHOUT BASE BLEED. THE IMPLIED DRAG COEFFICIENT SHALL BE OBTAINED WITH AND WITHOUT BASE BLEED IN THE COURSE OF CARRYING OUT SOME 10(3) FIRINGS UTILIZING A FULL NOMINAL PROPELLANT LOAD. VARIOUS CANDIDATE SOLID WAFER CHEMICAL COMPOSITIONS SHALL ALSO BE SYSTEMATICALLY INVESTIGATED. IN PARALLEL TO THIS WORK, DETAILED NUMERICAL SIMULATIONS OF THE COMPRESSIBLE, TURBULENT, REACTING FLOW SHALL BE OBTAINED UTILIZING THE FULL EQUATIONS OF MOTION IN ORDER TO SPECIFY THE OPTIMUM WAFER COMPOSITION/DESIGN AND GUIDE THE EXPERIMENT. POST-PHASE II NON-SBIR DEVELOPMENT, REQUIRED TO COMPLETE THE WORK ASSOCIATED WITH INCORPORATING BASE BLEED INTO ADVANCED AMMUNITION GOING INTO INVENTORY, SHALL BE PLANNED AT THE CONCLUSION OF THE TESTS.

HOLAMAX CORP (OLD: RALCON & PULSON IND) ARMY
6925 UNION PARK CTR - STE 500
MIDVALE, UT 84047
CONTRACT NUMBER:
RICHARD D RALLISON
TITLE:
HOLOGRAPHIC MATERIALS AND DEVICE DEVELOPMENT
TOPIC# 68 OFFICE: CECOM/AMSEL

A CONTINUING EFFORT IS MADE TO FIND THE PERFORMANCE LIMITS OF SEVERAL VOLUME HOLOGRAPHIC POLYMERS. DEVICES USEFUL FOR MAKING HOLOGRAMS ARE ALSO DEVELOPED INTO COMMERCIAL DEVICES SUCH AS A FRINGE LOCKER, A LINE SCANNER/SEQUENCER, A FIBER OPTIC BEAMSPLITTER, SOME MASS PRODUCTION MACHINERY AND A DESIGN SOFTWARE PACKAGE. THE PRIMARY OBJECTIVE OF THIS WORK IS TO FIND WAYS TO MAKE USEFUL HOLOGRAPHIC OPTICAL ELEMENTS, ESPECIALLY HIGH DENSITY NOTCH FILTERS TO BE USED AS LASER PROTECTIVE EYEWEAR. METHODS FOR USING THE MEDIUMS ARE DEVELOPED AS WELL AS MACHINERY FOR USE IN A MANUFACTURING EFFORT. DMP 128 AND A NEW POLYMER DUBBED HOLAMAX BRW ARE INITIALLY OF CENTRAL DEVELOPMENT INTEREST. SOME DEVICES MAY BE MADE IN DCT OR PVK ALSO.

HOODWIN INSTRUMENTS ARMY
RTE 1 - BOX 246
SAWYER, MI 49125
CONTRACT NUMBER:
LOUIS S HOODWILL
TITLE:
CRANKSHAFT ANGULAR ACCELEROMETER
TOPIC# 119 OFFICE: TACOM/AMSTA

SUBMITTED BY DEPT

A NEW ANGULAR ACCELEROMETER WILL BE DESIGNED THAT MAY BE EASILY MOUNTED ON THE ACCESSORY ENDS OF THE ENGINE CRANKSHAFTS IN MILITARY VEHICLES. TO SIMPLIFY MOUNTING AND COUPLING, THE ACCELEROMETER WILL BE MADE SUFFICIENTLY SMALL AND LIGHT IN WEIGHT SO IT MAY BE MOUNTED BY MEANS OF ITS INPUT SHAFT. THIS SYSTEM OF MOUNTING AND COUPLING WILL ENSURE SUFFICIENT HIGH FREQUENCY RESPONSE TO MEASURE THE TORQUE PULSES PRODUCED BY THE FIRING OF INDIVIDUAL CYLINDERS AT HIGH SPEED. THE FLAT LOW FREQUENCY RESPONSE OF THE ACCELEROMETER WILL ENABLE THE OBTAINING OF ENGINE SPEED VS TORQUE CURVES WITHOUT A DYNAMOMETER. AFTER A DESIGN HAS BEEN DEVELOPED THAT SATISFIES THE PERTINENT MECHANICAL AND ELECTRICAL REQUIREMENTS, ACCELEROMETERS WILL BE FABRICATED AND SUBMITTED TO TACOM FOR POSSIBLE FIELD TESTING.

HUMBUG MOUNTAIN RESEARCH LABS NAVY
PO BOX 1380
DUARTE, CA 91010
CONTRACT NUMBER:
DR ALAN A VETTER
TITLE:
LASER CENTERLINE LOCALIZER FOR CV AND CVN FLIGHT OPERATIONS
TOPIC# 162 OFFICE: NAVAIR/NAEC

THE LASER CENTERLINE LOCALIZER (LCL) USES A SERIES OF LOW POWER, BUT HIGHLY VISIBLE LASER BEAMS TO ILLUMINATE APPROACH CORRIDORS FOR CARRIER FLIGHT OPERATIONS. BY TAKING ADVANTAGE OF THE ABILITY TO PRECISELY SHAPE AND DIRECT VISIBLE LASER BEAMS, AND BY ENCODING THE ILLUMINATED PATHS USING COLOR AND TEMPORAL FREQUENCY, IT IS POSSIBLE TO PROVIDE DIRECT VISUAL SIGNALS TO THE PILOT THAT INDICATE DEVIATIONS FROM THE CENTERLINE APPROACH. THIS SYSTEM PROVIDES BOTH ON COURSE INFORMATION AS WELL AS THE DIRECTION AND DEGREE OF DEVIATION FROM THE PROPER APPROACH. BY USING THIS SYSTEM, THE PILOT WILL HAVE SIGNIFICANTLY IMPROVED VISUAL CUES, PARTICULAR AT NIGHT AND IN MARGINAL WEATHER, TO AID IN THE SAFE RECOVERY OF THE AIRCRAFT. THIS RESEARCH PROGRAM IS DIRECTED AT PROVING THE VIABILITY OF THE LCL CONCEPT AND DESIGN VERIFICATION DATA FOR AN LCL SYSTEM DESIGN.

HY-TECH RESEARCH CORP DNA
PO BOX 3422
RADFORD, VA 24143
CONTRACT NUMBER: DNA87-C-0281
ROBERT C HAZELTON
TITLE:
RESONANT HOLOGRAPHY TO STUDY PLASMA EROSION OPENING SWITCHES DEVELOPMENT
TOPIC# 2 OFFICE: AM

SUBMITTED BY DEPT

THIS PROPOSAL APPLIED LASER HOLOGRAPHY AS A DIAGNOSTIC TOOL TO THE STUDY OF PLASMA EROSION SWITCHES. IT THEREFORE COMBINES TWO DEVELOPING TECHNOLOGIES TO ENABLE US TO NON-INTRUSIVELY MEASURE THE DENSITY PROFILE OF THE ERODING PLASMA IN THE SWITCH.

HYPRES INC AF
500 EXECUTIVE BLVD
ELMSFORD, NY 10523
CONTRACT NUMBER:
MASOUD RADPARVAR
TITLE:
SUPERCONDUCTING MILLIMETER WAVE PHASE SHIFTER
TOPIC# 56 OFFICE: RADC/DOR

HYPRES PROPOSES TO DESIGN, FABRICATE, AND EVALUATE SUPERCONDUCTING MICROSTRIP INTERFEROMETERS AS VERY BROADBAND, LOW POWER PHASE SHIFTERS. HYPRES WILL DRAW UPON ITS EXPERTISE IN ADVANCED SUPER-CONDUCTING ELECTRONICS TECHNOLOGIES TO DEVELOP SUCH PHASE SHIFTERS SUITABLE FOR INCORPORATION INTO A MILLIMETER-WAVE PHASED-ARRAY ANTENNA. THIS UNIQUE PHASE SHIFTER COMBINES THE PHYSICS OF NON-EQUILIBRIUM SUPERCONDUCTIVITY WITH HIGH PERFORMANCE SUPERCONDUCTING TRANSMISSION LINES TO ACHIEVE CONTINUOUS MODULATION OF THE PHASE VELOCITY BY ELECTRONIC OR OPTICAL MEANS. HYPRES WILL FIRST DETERMINE THE OPTIMAL CONFIGURATION AND MEANS OF ACHIEVING SUCH MODULATION AND QUANTIFY THE CHANGE IN INDUCTANCE OF THE MICROSTRIPS. THE PHASE SHIFTER WILL SUBSEQUENTLY BE IMPLEMENTED USING THESE PRE-DETERMINED TECHNIQUES. THE THIN FILM FABRICATION OF MICROSTRIPS WILL ENSURE LARGE SCALE REPRODUCIBILITY AND PERMIT NUMEROUS CIRCUITS ON A WAFER AS REQUIRED FOR A LARGE NUMBER OF PHASE SHIFTERS.

IAP RESEARCH INC SDIO
2763 CULVER AVE
DAYTON, OH 45429
CONTRACT NUMBER:
DR JOHN P BARBER
TITLE:
ADVANCED METAL ARMATURE DEVELOPMENT
TOPIC# 2 OFFICE:

SUBMITTED BY DEPT

INCREASING THE EFFICIENCY OF A RAILGUN ARMATURE WOULD SIGNIFICANTLY IMPROVE THE EFFICIENCY OF A RAILGUN LAUNCHER ITSELF. REDUCING THE ARMATURE ENERGY LOSS FROM 30-50% TO 10% OR LESS OF THE ENERGY DELIVERED TO THE BARREL WOULD RESULT IN A SUBSTANTIAL REDUCTION IN POWER REQUIREMENTS AND A DRAMATIC INCREASE IN BARREL LIFE. PREFORMANCE CHARACTERISTICS OF METAL ARMATURES ARE BETTER THAN PLASMA ONES; HOWEVER, METAL ARMATURES ARE MASSIVE AND ENERGY MUST BE SUPPLIED TO ACCELERATE THE ARMATURE MASS. IN A PREVIOUS RESEARCH EFFORT, THE FEASIBILIITY WAS ESTABLISHED THAT ADVANCED COMPOSITE MATERIALS COULD SIGNIFICANTLY REDUCE ARMATURE MASS, AND THAT THE REQUIRED MATERIALS (ALUMINUM-LITHIUM AND BERYLLIUM-LITHIUM) COULD BE FABRICATED EXPERIMENTALLY AS LAYERED COMPOSITES. UNDER THE CURRENT RESEARCH, THE POTENTIAL MASS REDUCTION IN AN INTEGRATED ARMATURE/LAUNCH PACKAGE IS BEING DEMONSTRATED. A SERIES OF KEY QUESTIONS ARE BEING ADDRESSED INVOLVING MATERIALS FABRICATION, MATERIALS HAZARD CONTROL, MATERIALS PROPERTIES, AND ARMATURE/LAUNCH PACKAGE DESIGN. SUCCESSFUL COMPLETION OF THIS RESEARCH EFFORT WILL HAVE IMMEDIATE IMPACT ON THE FEASIBILITY OF RAILGUN SYSTEMS FOR DEFENSE APPLICATIONS. A NEW CLASS OF COMPOSITE MATERIALS WITH AN EMPHASIS ON TAILORED ELECTROTHERMAL PROPERTIES WOULD BE IMPORTANT IN MANY COMMERCIAL APPLICATIONS INCLUDING LOW MASS, LOW RESISTANCE CONDUCTORS, THERMAL ENERGY STORAGE, AND HIGH PERFORMANCE FUSE MATERIALS.

INDUSTRIAL QUALITY INC NAVY
PO BOX 2397 - 9832 CANAL RD
GAITHERSBURG, MD 20879
CONTRACT NUMBER:
HAROLD BERGER
TITLE:
IMPROVED GLASS X-RAY SCINTILLATOR
TOPIC# 127 OFFICE: NWC/SSPO

REAL-TIME X-RAY IMAGING USED FOR DIAGNOSTIC STUDIES AND NONDESTRUCTIVE TESTING IS LIMITED IN TERMS OF IMAGE QUALITY BY THE STATISTICAL FLUCTUATIONS OF THE PHOTONS USED TO FORM THE IMAGE. A CRITICAL POINT IN THE STATISTICAL EVALUATION OF MODERN REAL-TIME X-RAY IMAGE IS SET BY THE ABSORPTION OF THE X-RAY PHOTONS IN THE PRIMARY DETECTOR, USUALLY AN X-RAY-TO-LIGHT CONVERSION SCREEN. THE THE IMAGE STATISTICS AND THE RESULTANT IMAGE QUALITY CAN BE IMPROVED IF THE DETECTOR USEFULLY ABSORBED A LARGER PERCENTAGE OF THE X-RAY

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PHOTONS. THIS PROPOSAL IS DIRECTED TOWARD THAT OBJECTIVE THROUGH THE DEVELOPMENT OF A NEW, HIGH DENSITY, X-RAY SCINTILLATING GLASS. THE PHASE I PROGRAM HAS BROUGHT ABOUT THE DEVELOPMENT OF USEFUL SCINTILLATING GLASSES WITH DENSITIES OF 4g/cc AND HIGHER. THE PHASE II PROGRAM WILL BE DIRECTED TOWARD OPTIMIZING SELECTED GLASSES IN TERMS OF ACTIVATOR CONCENTRATIONS AND ADDITIONAL HEAVY CONSTITUENTS. GLASSES WILL BE FORMULATED AND TESTED AT LOW, MEDIUM AND HIGH (MeV) X-RAY ENERGIES TO DETERMINE DETECTOR EFFICIENCY, LIGHT OUTPUT, AND DECAY CHARACTERISTICS. A MAJOR OBJECTIVE OF THE PHASE II PROGRAM IS THE PREPARATION AND TESTING OF A LARGE AREA GLASS SCINTILLATOR AS A PRODUCT PROTOTYPE.

INDUSTRIAL QUALITY INC NAVY
PO BOX 2397 - 9832 CANAL RD
GAITHERSBURG, MD 20879
CONTRACT NUMBER:
THOMAS S JONES
TITLE:
INFRARED INSPECTION OF SPOT WELDS
TOPIC# 186 OFFICE: DTRC/NAVSEA

A RELIABLE NONDESTRUCTIVE TESTING (NDT) METHOD TO INSPECT SPOT WELDS IN STAINLESS STEEL WILL CLEAR THE WAY TO INCREASE DUE TO THESE LIGHT-WEIGHT, HIGH STRENGTH CORRUGATED STAINLESS STEEL SPOT WELDED PANELS IN SHIP AND OTHER CONSTRUCTION AND APPLICATIONS. IN THE PHASE I PROGRAM, IT WAS CLEARLY DEMONSTRATED THAT A NOVE INFRARED INSPECTION METHOD PERMITTED THE DIFFERENTIATION BETWEEN GOOD AND BAD QUALITY SPOT-WELDS IN STAINLESS STEEL CORRUGATED STRUCTURE. GOOD WELDS ARE CHARACTERIZED BY PEEL STRENGTHS IN EXCESS OF 400 POUNDS AND FAILURE BY PULLING THE NUGGET OUT OF THE CORRUGATED SHEET. BAD WELDS TYPICALLY HAVE FAILURE LOADS OF LESS THAN 250 POUNDS AND FAIL AT THE INTERFACE BETWEEN THE TWO SHEETS. IN THE PHASE II PROGRAM, WE PROPOSE TO BUILD ON THE INFORMATION OBTAINED IN THE PHASE I PROGRAM AND DETERMINE MORE EFFICIENT METHODS FOR HEATING, INFRARED SENSING, AND DATA PROCESSING. THE INFRARED INSPECTION APPROACH CAN BE PERFORMED WITH ACCESS ONLY TO THE OUTER SKIN OF THE CORRUGATED STRUCTURE AND OFFERS THE POTENTIAL FOR RAPID INSPECTION. THE OBJECTIVE OF THE PHASE II PROGRAM IS TO DEVELOP A MAN-PORTABLE INFRARED INSPECTION SYSTEM THAT CAN BE USED ON BOARD SHIP TO DETECT DEFECTIVE SPOT-WELDS.

INFORMATION RESEARCH LAB INC ARMY
415 BRADFORD PL
NORTH DARTMOUTH, MA 02747
CONTRACT NUMBER:
DR C H CHEN
TITLE:
HIGH RESOLUTION ULTRASONIC SPECTROSCOPY SYSTEM FOR NONDESTRUCTIVE EVALUATION
TOPIC# 132 OFFICE: LABCOM/MTL

SUBMITTED BY DEPT

THE ULTRASONIC SPECTROSCOPY METHOD OF NONDESTRUCTIVE EVALUATION, PIONEERED BY OTTO GERICKE, HAS SHOWN IN PHASE I TO BE TECHNICALLY FEASIBLE WITH THE SUPPORT OF MODERN HIGH RESOLUTION SPECTRAL ANALYSIS AND RELATED SIGNAL PROCESSING AND PATTERN RECOGNITION TECHNIQUES. THERE IS A CLEAR DEMAND TO DEVELOP SUCH A SYSTEM THAT CAN MEET MANY NDE REQUIREMENTS FOR ARMY, OTHER AGENCIES AND COMMERCIAL SECTORS. ONE EFFORT OF PHASE II IS TO PERFORM FURTHER SIGNAL PROCESSING AND PATTERN RECOGNITION RESEARCH IN NDE. THE MAIN EFFORT OF PHASE II IS HOWEVER FOCUSED ON RESEARCH AND DEVELOPMENT OF SUCH SYSTEM THAT APPLIED HIGH RESOLUTION ULTRASONIC SPECTROSCOPY TO VARIOUS STRUCTURAL MATERIALS. THE SYSTEM IS INTERACTIVE AND USER FRIENDLY AND IS SUPPORTED BY MOST ADVANCED SIGNAL PROCESSING CAPABILITIES FOR FLAW CHARACTERIZATION, DISCRIMINATION AND PREDICTION. BOTH SOFTWARE AND HARDWARE ISSUES OF THE SYSTEM WILL BE ADDRESSED AND EXTENSIVE TESTING IN DIFFERENT APPLICATIONS IS ALSO PROPOSED. THE INTEGRATION OF PERSONAL COMPUTER WITH NDE INSTRUMENTATION AND ADVANCED SOFTWARE CAPABILITY MAKES THE ULTRASONIC SPECTROSCOPY SYSTEM EFFECTIVE IN BOTH PERFORMANCE AND COST.

INFORMATION SYSTEMS LABS ARMY
6870 ELM ST - STE 300
MCLEAN, VA 22101
CONTRACT NUMBER:
JOHN E DON CARLOS
TITLE:
SKYWAVE HFDF CRITICAL NODES
TOPIC# 53 OFFICE: CECOM/AMSEL

HF TRANSMITTERS OPERATING WITH ENEMY 2ND ECHELON FORCES CAN BE ACHIEVED VIA SKY WAVE PROPAGATION AFTER REFLECTION FROM THE IONOSPHERE AND, WITH A SUITABLE RDF SYSTEM, CAN BE LOCATED. PAST SYSTEMS HAVE REQUIRED NETWORKS OF LARGE, FIXED CIRCULAR ARRAYS (WULLENWEBERS) FOR GOOD LOCATION ACCURACY. NETWORKS OF TRANSPORTABLE ARRAYS (ADCOCKS) HAVE BEEN USED TACTICALLY WITH LESS ACCURACY AND HIGH SUSCEPTIBILITY TO INTERFERENCE. RECENT ADVANCES IN SIGNAL PROCESSING TECHNOLOGY PRESENT THE OPPORTUNITY TO DEPLOY A PORTABLE TACTICAL HF EMITTER LOCATION SYSTEM HAVING GOOD ACCURACY AND INTERFERENCE REJECTION. THIS PROJECT WILL DEVELOP THE MODEL TO EVALUATE SYSTEMS ALTERNATIVES, EXPECTED SYSTEM PERFORMANCE, AND HARDWARE IMPLEMENTATION REQUIREMENTS. PERFORMANCE OF NOVEL

SUBMITTED BY DEPT

TECHNOLOGIES AND ALGORITHMS WILL BE ANALYZED.

INSTITUTE FOR SYSTEMS ANALYSIS AF
7209 ARMAT DR
BETHESDA, MD 20817
CONTRACT NUMBER: F1628-86-C-0171
DR DAVID S ALBERTS
TITLE:
ADA COSTING EXPERT SYSTEM (ACES)
TOPIC# 43 OFFICE: ESD/XRCT

THE OBJECTIVE OF THE PROPOSED RESEARCH IS TO REFINE, CALIBRATE, VALIDATE AND ENHANCE THE ADA COSTING EXPERT SYSTEM (ACES) MODEL DEVELOPED UNDER THE PHASE I EFFORT; TO DISSEMINATE INFORMATION ABOUT THE MODEL THROUGHOUT THE SOFTWARE SIZING COMMUNITY; AND TO ESTABLISH A CLEARINGHOUSE TO COLLECT NEW EMPIRICAL DATA AND FEEDBACK FROM THE USER COMMUNITY TO BE USED FOR CONTINUED MODEL ENHANCEMENT AND EVOLUTION. THE RESULTING MODEL WILL PRODUCE ACCURATE COST ESTIMATES AT ALL PHASES OF THE PROJECT LIFE CYCLE, AS WELL AS PROVIDE A USEFUL TOOL FOR REQUIREMENTS SPECIFICATION, BUDGETING AND PROJECT MONITORING ACTIVITIES; AND WILL ALSO SUPPORT TRADE-OFF ANALYSES OF THE POTENTIAL IMPACT OF VARIOUS TOOLS AND PROGRAMMING PROCEDURES ON THE COST AND QUALITY OF THE RESULTING SOFTWARE.

INTEGRATED SYSTEMS INC ARMY
2500 MISSION COLLEGE BLVD
SANTA CLARA, CA 95054
CONTRACT NUMBER:
ROBERT A WALKER
TITLE:
INTEGRATED ARTIFICIAL INTELLIGENCE AND TRAJECTORY GUIDANCE TO ACHIEVE ROBOTIC TASK PLANNING/CONTROL
TOPIC# 28 OFFICE: ARDEC

TRADITIONAL APPROACHES TO THE FEEDBACK CONTROL OF ROBOTS HAVE DEPENDED EXCLUSIVELY ON OPEN-LOOP TRAJECTORY COMMANDS. THE PERFORMANCE OBJECTIVES OF A HIGHLY FLEXIBLE, INTELLIGENT ROBOT CAN ONLY BE ACHIEVED THROUGH S FUNDAMENTAL DEVELOPMENT AND INTEGRATION OF PLANNING LOGIC AND FEEDBACK CONTROL. HIGHER LEVEL DECISION MAKING

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FUNCTIONS WILL BE NECESSARY, REQUIRING THE APPLICATION OF ARTIFICIAL INTELLIGENCE (AI) TECHNIQUES. THE PROPOSED APPROACH AIMS AT THE INTERFACE OF AI TASK PLANNING AND BOTH OPTIMIZATION-BASED AND RULE-BASED CONTROL. THE KEY CAE TOOLS TO SPECIFY THE INTERFACE BETWEEN THE TWO DIFFERENT METHODOLOGIES FOR THEIR EFFECTIVE INTEGRATION WILL BE DESIGNED. THE PROPOSED RESEARCH WILL DEVELOP A NEW METHODOLOGY IN WHICH AI METHODS CAN BE USED FOR ROBOTIC TASK PLANNING UTILIZING ADVANCED TASK-ORIENTED CONTROL LAWS. THE PHASE II EFFORT WILL RESEARCH AND DEVELOP PROTOTYPE ROBOTIC TASK PLANNER, INTERFACE IT TO A ROBOTIC MANIPULATOR, DEVELOP TASK-ORIENTED RULE-BASED CONTROL LAWS TO AI PLANNING IN MEANINGFUL ASSEMBLY TASKS.

INTEGRITY SYSTEMS INC AF
600 MAIN ST - STE 4
WINCHESTER, MA 01890
CONTRACT NUMBER: F33615-87-C-1520
DR NEAL A CARLSON
TITLE:
DISTRIBUTED KALMAN FILTER ARCHITECTURES
TOPIC# 117 OFFICE: AFWAL/AA

THIS PHASE II EFFORT WILL IMPLEMENT, TEST AND DEMONSTRATE PROMISING NEW FILTER ARCHITECTURES DEVELOPED DURING PHASE I FOR USE IN ADVANCED, MULTI-SENSOR NAVIGATION SYSTEMS. THE NEW ARCHITECTURES APPLY TO DECENTRALIZED SYSTEMS WITH PARALLEL PROCESSING CAPABILITIES, INCLUDING MULTIRATE, CASCADED AND FEDERATED CONFIGURATIONS. THEY ACCOMMODATE SYSTEMS WITH MULTIPLE LOCAL FILTERS, AND YIELD ESTIMATES THAT ARE GLOBALLY OPTIMAL OR CONSERVATIVELY SUBOPTIMAL, DEPENDING UPON THE MASTER FILTER PROCESSING RATE. THE NEW ARCHITECTURES PROMISE SIGNIFICANT IMPROVEMENTS IN THROUGHPUT (SPEED), ACCURACY, FAULT TOLERANCE, REAL-TIME SOFTWARE SIMPLICITY, AND SYSTEM DEVELOPMENT COSTS. PHASE II WILL PROVIDE PROVEN IMPLEMENTATIONS OF THESE INNOVATIVE FILTER ARCHITECTURES, SO THAT NAVIGATION SYSTEM DESIGNERS CAN TAKE ADVANTAGE OF THE RESULTING PERFORMANCE AND RELIABILITY IMPROVEMENTS FOR BOTH CURRENT-GENERATION AND NEXT-GENERATION AVIONICS SYSTEMS. AMONG THE PHASE II DELIVERABLES ARE GENERAL-PURPOSE FORTRAN AND ADA SOFTWARE PACKAGES.

INTERNATIONAL TECHNICAL ASSOCS INC AF
2281 CALLE DE LUNA
SANTA CLARA, CA 95054
CONTRACT NUMBER:
RANDAL D ROBINSON
TITLE:
ND:YAG LASER ROBOTIC WORKCELL FOR REPAIRING JET ENGINE COMPONENTS
TOPIC# 302 OFFICE: AFWAL/ML(LN)

SUBMITTED BY DEPT

THE MAJORITY OF JET ENGINES SUBJECTED TO ROUTINE OVERHAUL REQUIRE REPAIR OF COMPONENTS BY CUTTING OUT DAMAGE AREAS AND THEN WELDING IN PATCHES OF GOOD MATERIAL. AN EVALUATION OF Nd:YAG LASER PROCESSING REVEALED THAT IT WAS WIDELY APPLICABLE TO CUTTING AND MODERATELY APPLICABLE TO WELDING FOR THESE REPAIR OPERATIONS. CONSEQUENTLY, THE PROPOSED EFFORT IS DIRECTED TOWARD SOLVING PROBLEMS THAT WILL ALLOW A VERSATILE, EASILY OPERATED SYSTEM TO BE BUILT TO PERFORM THESE OPERATIONS. THE SPECIFIC OBJECTIVES OF THIS EFFORT ARE FOUR FOLD. FIRST, INTEGRATE A SUITABLE FIBER OPTIC WITH A 400 WATT AVERAGE POWER, PULSED, Nd:YAG LASER IN ORDER TO ELIMINATE THE PROBLEMS ASSOCIATED WITH USING A CONVENTIONAL BEAM DELIVERY SYSTEM. SECOND, DESIGN AND BUILD A SUITABLE END EFFECTOR. THIRD, REFINE InTA'S THREE DIMENSIONAL STRUCTURED LIGHT VISION SYSTEM IN ORDER TO REDUCE ITS COST WITHOUT EXCESSIVE LOSS IN SPEED. THE REFINED VISION WILL BE INTEGRATED WITH THE END EFFECTOR. FOURTH, INTEGRATE THESE COMPONENTS WITH A ROBOT SO THAT THE SYSTEM CAN BE ELEVATED FOR CAPABILITIES AND LIMITATIONS.

JAYCOR AF
PO BOX 85154 - 11011 TORREYANA RD
SAN DIEGO, CA 92138
CONTRACT NUMBER:
DR JAMES H STUHMILLER
TITLE:
ICBM STRUCTURAL AND TRAJECTORY DESIGN SIMULATION
TOPIC# 251 OFFICE: BMO/MYSC

THE OBJECTIVE OF THE PROPOSED PROJECT IS TO PRODUCE, DOCUMENT, AND DELIVER TO THE AIR FORCE A CUSTOMIZED VERSION OF FLEXIT THAT WILL ALLOW RAPID, SELF-CONSISTENT EVALUATION OF ICBM DESIGNS. THE PROGRAM WILL HAVE AN INPUT/OUTPUT INTERFACE THAT WILL ALLOW A WIDE RANGE OF USERS TO CONFIGURE DESIGNS, PERFORM ANALYSES, AND WRITE NECESSARY REPORTS. THE PROGRAM WILL RUN EFFICIENTLY ON A DESKTOP COMPUTER AND WILL HAVE PROVISIONS FOR INTERFACING WITH OTHER COMPUTER SYSTEMS AND PROGRAMS.

JAYCOR ARMY
1221 LAKE PLAZA DR
COLORADO SPRINGS, CO 80906
CONTRACT NUMBER: DAAL02-86-C-0069
RANDALL K WHITE
TITLE:
LOGISTICS SUPPORT OF NUCLEAR SURVIVABLE EQUIPMENT
TOPIC# 91 OFFICE: LABCOM/HDL

SUBMITTED BY DEPT

THIS RESEARCH PROGRAM DEVELOPS HARDNESS ASSURANCE, HARDNESS MAINTENANCE, AND HARDNESS SURVEILLANCE (HAMS) APPROACHES FOR ARMY IMPLEMENTATION WHICH WILL ENSURE LIFE CYCLE SURVIVABILITY OF NUCLEAR HARDENED TACTICAL EQUIPMENT. THIS PHASE II EFFORT IS A CONTINUATION OF A PHASE I PROGRAM WHICH DETERMINED HOW TO INTEGRATE HAMS-UNIQUE REQUIREMENTS INTO PROCUREMENT DIRECTIVES FOR ACQUISITION OF NEW TACTICAL (HARDENED) SYSTEMS. THIS EFFORT WILL DEVELOP AN ARMY APPROACH FOR NON DEVELOPMENT ITEMS (NDI) AND PRODUCT IMPROVEMENT PROGRAMS (PIP). IT WILL ALSO INITIATE SPECIFIC HARDNESS AWARENESS INSTRUCTION AND TRAINING EFFORTS TO EDUCATE ARMY PERSONNEL ON THE IMPORTANCE OF SYSTEM SURVIVABILITY AND THE NEED FOR HARDNESS MAINTENANCE.

JRS RESEARCH LABS INC AF
202 W LINCOLN AVE - #A
ORANGE, CA 92665
CONTRACT NUMBER: F33615-87-C-1518
ROBERT J SHERAGA
TITLE:
AUTOMATIC DERIVATION OF PERFORMANCE CONSTRAINTS AND GENERATION OF DESIGN GUIDELINES
TOPIC# 122 OFFICE: AFWAL/AA

ONE OF THE MAJOR ISSUES THAT EXISTS IN THE DESIGN PROCESS FOR HIGH PERFORMANCE COMPUTERS IS THAT OF DETERMINING, SPECIFICALLY, THE REASONS WHY A PARTICULAR DESIGN ACHIEVES A PARTICULAR PERFORMANCE MEASURE FOR AN APPLICATION PROBLEM OF INTEREST (ELG., A BENCHMARK). THAT IS, IT IS OF INTEREST TO KNOW WHICH CHARACTERISTICS OF THE DESIGN HAVE CONSTRAINED ITS PERFORMANCE AND WHICH CHARACTERISTICS MAKE IT MORE EFFECTIVE THAN OTHER DESIGNS. IF ONE COULD AUTOMATICALLY DERIVE THIS TYPE OF INFORMATION AND PROVIDE IT TO DESIGNERS EARLY IN THE DESIGN PROCESS, THEN THE OVERALL QUALITY OF DESIGNS SHOULD IMPROVE AND THE PROBABILITY OF MISSION SUCCESS SHOULD INCREASE MEASUREABLY. THE PROPOSED APPROACH TO THIS PROBLEM IS TO UTILIZE THE JRS INTEGRATED DESIGN AUTOMATION SYSTEM AS A STARTING POINT AND TO THEN ADD TO IT THE CAPABILITY TO DERIVE THE INFORMATION OF INTEREST. THE PRIMARY EXTENSIONS TO THE SYSTEM WOULD BE IN THE FORM OF COMPREHENSIVE INSTRUMENTATION PACKAGES THAT WOULD BE INTEGRATED WITH THE EXISTING MICROCODE OPTIMIZATION ELEMENT IN A FORM THAT CAN BE PROCESSED FOR MEANINGFUL PRESENTATION TO A DESIGNER. ADDITIONAL

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EXTENSION TO THE EXISTING SYSTEM WOULD TAKE THE FORM OF CONTROL ELEMENTS TO RESPOND TO DESIGNERS REQUESTS WHICH RESULT FROM AN EXAMINATION OF THE DATA PRESENTED. THE PHASE II EFFORT WILL EFFECT THE CHANGES TO THE EXISTING IDAS AND PROVIDE SUITABLE DEMONSTRATION OF THE TECHNOLOGY AND THE USER-SYSTEM INTERACTION.

KLEIN ASSOCIATES INC DARPA
PO BOX 264 - 800 LIVERMORE ST
YELLOW SPRINGS, OH 45387
CONTRACT NUMBER:
DR GARY A KLEIN
TITLE:
DEVELOPMENT OF A CASE-BASED REASONING SYSTEM SHELL
TOPIC# 16 OFFICE: DARPA

THERE IS A NEED FOR AN EXPERT SYSTEM THAT WILL ENABLE USERS TO GENERATE PLANS AND PREDICTIONS FROM EXPERIENCE WITH SINGLE CASES. CURRENT WORK ON CASE-BASED REASONING HAS BEEN EXTREMELY PROMISING AS A WAY OF TRANSCENDING SOME OF THE LIMITATIONS OF PREVIOUS EXPERT SYSTEM TECHNOLOGY. THE PROPOSAL IS TO DEVELOP A CASE-BASED REASONING SYSTEM THAT COULD HAVE APPLICATIONS IN A VARIETY OF MILITARY AND COMMERCIAL PROJECTS. THE STRATEGY IS TO DEVELOP A FRAME-BASED SHELL AND MODIFY IT SO THAT IT COULD TREAT THE FRAMES AS CASES. THE SHELL WOULD ENABLE USERS TO IDENTIFY RELEVANT CASES IN A DATA BASE, AND TO MODIFY THE CASES SO THAT THEY WERE TAILORED TO THE NEW SITUATION. THE INITIAL DEVELOPMENT WOULD FOCUS ON THE PROBLEM OF PREDICTING SURVIVABILITY/VULNERABILITY OF STRUCTURES EXPOSED TO SEVERE SHOCK WAVES. SUBSEQUENT DEVELOPMENT COULD PRODUCE A SHELL THAT COULD BE ADAPTED FOR USE IN THE OTHER DATA BASES.

KOFORD ENGINEERING ARMY
415 BELDEN AVE
ADDISON, IL 60101
CONTRACT NUMBER:
STUART KOFORD
TITLE:
IMPROVED MOSITURE RESISTANT POTTING MATERIALS/TECHNIQUES FOR IMAGE INTENSIFIERS
TOPIC# 64 OFFICE: CECOM/AMSEL

SUBMITTED BY DEPT

IN PHASE I UNIQUE MATERIALS WHICH PROVIDE FOR IMPROVED INSULATION RESISTANCE UNDER MOISTURE IN POTTED IMAGE INTENSIFIER MODULES WERE DEVELOPED. THESE INCLUDE STABLE FLUORO/SILANE HYDROPHOBIC COATINGS WHICH CHEMICALLY REACT WITH BOTH THE IMAGE INTENSIFIER TUBE AND THE POTTING MATERIAL, AND VERY LOW VISCOSITY, HYDROPHOBIC SILICONE POTTING MATERIALS WITH EXCELLENT INSULATION RESISTANCE. IN PHASE II, REFINEMENT OF FORMULATIONS AND APPLICATION METHODS AND MORE DETAILED CHARACTERIZATION OF SHELF LIFE, CLEANING, AND CURE REQUIREMENTS ARE PROPOSED. AN ADDITIONAL PART OF THE PROGRAM WILL BE THE DEVELOPMENT OF IMPROVED POTTING AND ADHESIVE MATERIALS FOR THE POWER SUPPLY WHICH IS A SUSPECTED WEAK LINK IN THE IMAGE INTENSIFIER UNIT. AFTER MATERIAL DEVELOPMENT AND EVALUATION IS COMPLETED, THE IMAGE INTENSIFIER WILL BE QUALIFICATION TESTED WITH THE NEW MATERIALS.

KTECH CORP DNA
901 PENNSYLVANIA NE
ALBUQUERQUE, NM 87110
CONTRACT NUMBER: DNA87-C-0253
ANTHONY J SMITH
TITLE:
AN IMPROVED GAMMA-RAY SIMULATOR FOR TREE VULNERABILITY AND SURVIVABILITY STUDIES
TOPIC# 2 OFFICE: DDST

IN THE EXPERIMENTAL ASSESSMENT OF THE NUCLEAR VULNERABILITY OF STRATEGIC WEAPON SYSTEMS THERE EXISTS A NEED FOR GAMMA-RAY SIMULATORS WITH PULSE DURATION FROM TENS OF NANOSECONDS TO TENS OF SECONDS. THIS PROPOSAL ADDRESSES THE OPTIMIZATION OF THE PULSED REACTOR SYSTEM WHICH CAN PROVIDE HIGH INTENSITY GAMMA PULSE WITH DURATIONS FROM APPROXIMATELY 50 MICROSECONDS TO SEVERAL MILLISECONDS. WORK CONDUCTED UNDER PHASE I HAS DEMONSTRATED THAT EXISTING NEUTRON TO GAMMARAY CONVERTERS CAN BE MADE SIGNIFICANTLY ("230%) MORE EFFICIENT FOR A SIMPLIFIED REACTOR SYSTEM. THIS CURRENT SUBMISSION ADDRESSES THE PROOF OF PRINCIPLE AND FURTHER OPTIMIZATION OF A CONVERTER SYSTEM DEPLOYED ON AN ACTUAL REACTOR.

L'GARDE INC AF
1555 PLACENTIA AVE
NEWPORT BEACH, CA 92663
CONTRACT NUMBER:
GILBERT J FRIESE
TITLE:
INFLATABLE SOLAR CONCENTRATOR FLIGHT TEST EXPERIMENT
TOPIC# 77 OFFICE: AFRPL/TSTR

SUBMITTED BY DEPT

PLANNING, DESIGN AND DEVELOPMENT TESTING FOR A FLIGHT EXPERIMENT OF AN INFLATABLE SOLAR CONCENTRATOR IS PROPOSED. A LARGE SOLAR CONCENTRATOR SYSTEM IS INTENDED FOR EVENTUAL APPLICATION AS THE COLLECTOR FOR THE SOLAR ROCKET, REQUIRING SUFFICIENT GROUND AND FLIGHT TESTING OF SUBSCALE MODELS. THE EXPERIMENT WILL PROVIDE INITIAL FLIGHT TEST DATA INDICATING THAT SUCH SYSTEMS CAN BE ERECTED IN SPACE ENVIRONMENTS AND THEN PERFORM SATISFACTORILY TO STRUCTURAL REQUIREMENTS, THEREBY GREATLY LOWERING THE RISK INVOLVED IN STAGING SUBSEQUENT MORE ELABORATE PERFORMANCE DEMONSTRATION EXPERIMENTS. SUCH A FLIGHT EXPERIMENT IS MADE FINANCIALLY FEASIBLE BY USE OF THE "GET AWAY SPECIAL", PROGRAM WHICH PROVIDES EXPERIMENTERS AN INEXPENSIVE ACCESS TO SPACE ON-BOARD NASA'S SPACE SHUTTLE. THE PACKAGED EXPERIMENT WILL BE EJECTED IN THE SPACE ENVIRONMENT FROM THE ORBITER, INFLATE TO ITS DIMENSIONS OF 7 X 9 METERS, AND THEN TRANSMIT THE REQUIRED DATA DOWN TO GROUND STATIONS ON THE EARTH. IN SUMMARY, THIS PROGRAM WILL PROVIDE DESIGN AND DEVELOPMENT TESTING OF HARDWARE FOR A SUBSEQUENT FLIGHT EXPERIMENT WHICH WILL DEMONSTRATE THAT SUCH SYSTEMS CAN BE ERECTED IN SPACE.

LAGUNA RESEARCH LAB DARPA
3015 RAINBOW GLEN
FALLBROOK, CA 92028
CONTRACT NUMBER:
HENDRICUS G LOOS
TITLE:
ADAPTIVE STOCHASTIC CONTENT-ADDRESSABLE MEMORY
TOPIC# 7 OFFICE: DARPA

A NEW ASSOCIATIVE MEMORY ARCHITECTURE HAS BEEN CONCEIVED, WHICH GIVES A LARGE INCREASE IN MEMORY CAPACITY OVER THE HOPFIELD MEMORY, AND PROVIDES IMPROVED ASSOCIATIVE RECALL AS WELL. FURTHERMORE, THE NEW MEMORY SOLVES THE PROBLEM OF OVERLEARNING IN UNSUPERVISED ADAPTIVE OPERATION. THE NEW ARCHITECTURE MAY BE DESCRIBED AS A REFLEXIVE HETERO-ASSOCIATIVE MEMORY WITHORTHONORMAL LABELS THAT ARE PROCESSED IN A CERTAIN NONLINEAR MANNER. THE OPERATION INVOLVES SIGNAL FLOW IN BOTH DIRECTIONS, AS IN A RESONATOR. IN EACH ITERATIVE CYCLE, DATA ARE CONVERTED INTO LABELS, WHICH THEN ARE TURNED BACK AGAIN INTO DATA. THE PHASE II OBJECTIVE IS THE FURTHER DEVELOPMENT AND ANALYSIS OF THIS ARCHITECTURE, AND THE CONSTRUCTION AND TESTING OF A RIG SUCH AS TO PROVIDE PROOF OF CONCEPT, AND THE

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CONDUCT OF EXPERIMENTS TO INVESTIGATE A NUMBER OF LOCAL ADAPTIVE MECHANISMS, AS WELL AS STOCHASTIC EFFECTS.

LASER SCIENCE INC AF
80 PROSPECT ST
CAMBRIDGE, MA 02139
CONTRACT NUMBER:
DR KEITH BOYER
TITLE:
THE E-BEAM GUN AND RELATED COMPONENT DESIGN FOR PULSED CO2 LASER FOR WINDSAT TRANSMITTER
TOPIC# 75 OFFICE: AFGL/XOP

THE WINDSAT PROGRAM OF THE UNITED STATES AIR FORCE PROPOSES TO DEVELOP A SATELLITE TO MEASURE GLOBAL WIND VELOCITIES TO AN ACCURACY OF 2 METERS/SECOND. THE FIRST VERSION IS INTENDED TO MEASURE VERTICAL VELOCITIES ONLY AT 2 MILLISECOND INTERVALS ALONG ITS TRAJECTORY BY MEANS OF LASER DOPPLER RADAR. THE OBJECTIVE OF THIS PROJECT IS TO CONDUCT AN EXPERIMENTAL INVESTIGATION OF THE DESIGN AND OPERATION OF A CO2 LASER TRANSMITTER WITH THE NECESSARY OPERATING CHARACTERISTICS AND TO VERIFY THE DESIGN OF ITS CRITICAL COMPONENTS BASED ON CONCLUSION REACHED IN A DETAILED ANALYSIS OF THE REQUIREMENTS. THE OPTIMUM TRANSMITTER IS BELIEVED TO BE A MOPA CONFIGURATION USING A LOW PRESSURE CW OSCILLATOR DRIVING A MULTI-PASS AMPLIFIER OPERATING AT 300 TORR PRESSURE, PUMPED BY AN E-BEAM CONTROLLED DISCHARGE. HOWEVER, CONSIDERATION WILL ALSO BE GIVEN TO AN INJECTION LOCKED OSCILLATOR CONFIGURATION. THE KEY FEATURES, WHICH WILL REQUIRE CLOSE ATTENTION AND VERIFICATION, ARE THE FREQUENCY STABILITY OF 200 kHz MAXIMUM VARIATION OVER THE 10 MICROSECOND OUTPUT PULSE, THE LIFETIME OF 10 TO THE 9TH POWER PULSES WITHOUT MAINTENANCE AND HIGH EFFICIENCY TO PERMIT THE SIZE AND WEIGHT OF THE ULTIMATE HARDWARE TO BE MINIMIZED. THE E-BEAM GUN IS ONE OF THE MOST CRITICAL ELEMENTS OF THIS DEVELOPMENT WHOSE LIFE AND RELIABILITY MUST BE ESTABLISHED.

LASER TECHNOLOGIES INC AF
10131 COLONIAL INDUSTRIAL DR
SOUTH LYON, MI 48178
CONTRACT NUMBER:
J PETER NIEDZIELSKI
TITLE:
LASER PAINT REMOVAL SYSTEM
TOPIC# 153 OFFICE: AFWAL/ML

SUBMITTED BY DEPT

THE PURPOSE OF THIS WORK IS TO QUANTITATIVELY DEFINE THE CAPABILITIES OF THE LTI LASER SURFACE CLEANING SYSTEM FOR LASER PAINT REMOVAL AS APPLIED TO AIR FORCE REQUIREMENTS. SAMPLES OF AIRFRAME MATERIALS, INCLUDING ALUMINUM, TITANIUM AND GRAPHITE FIBER COMPOSITES, WILL BE SUBJECTED TO REPEATED PAINTING AND LASER CLEANING CYCLES, WITH TESTING TO DETERMINE THE EFFECTS, IF ANY, OF SUCH REPEATED EXPOSURE TO LASER ENERGY ON ALL SIGNIFICANT PROPERTIES OF THE MATERIALS. A SUFFICIENT NUMBER OF SAMPLES WILL BE TESTED TO PROVIDE STATISTICALLY SIGNIFICANT DATA TO SUPPORT APPLICATION OF THE METHODOLOGY. TURBINE BLADE SAMPLES WILL ALSO BE CLEANED AND TESTED. IN ADDITION CHARACTERIZATION OF OFF-GAS PRODUCTS WILL BE INCLUDED TO DEVELOP DATA FOR DESIGN OF AN OFF-GAS COLLECTION AND HANDLING SYSTEM. PRE-LIMINARY STUDIES OF THE CONTROL PROBLEMS ASSOCIATED WITH APPLICATION OF THIS TECHNOLOGY TO AIRCRAFT WILL BE INCLUDED. SUCH STUDIES WILL BE DESIGN STUDIES UTILIZING THE RESULTS OF THIS WORK TO DETERMINE THE DEGREE TO WHICH AUTOMATED CONTROL SYSTEMS ARE REQUIRED TO APPLY THIS TECHNOLOGY TO CLEANING OF AIRCRAFT.

LASER-GENICS CORP ARMY
PO BOX 611330
SAN JOSE, CA 95161
CONTRACT NUMBER:
DR RICHARD SCHLECHT
TITLE:
SINGLE CRYSTAL GROWTH OPTIMIZATION OF MAGNETIUM DOPED LITHIUM NIOBATE
TOPIC# 128 OFFICE: LABCOM/MTL

THE OBJECTIVE OF THE PROPOSED PHASE II SBIR PROGRAM IS TO OPTIMIZE THE GROWTH OF NgO:LiNbO(3). IN ORDER TO ACHIEVE THIS OBJECTIVE, CAREFUL MEASUREMENTS OF BOTH SCATTERING AND ABSORPTION LOSSES MUST BE MADE IN THESE CRYSTALS. DURING THE PHASE I EFFORT WE SUCCESSFULLY DEVELOPED A FACILITY TO CAREFULLY MEASURE THE SCATTERING LOSSES IN THESE CRYSTALS AND DEMONSTRATED THE SENSITIVITY OF THE TECHNIQUE ON SEVERAL SAMPLES. DURING THE PHASE II PROGRAM WE WILL DEVELOP A SENSITIVE APPARATUS FOR MEASURING VERY LOW ABSORPTION LOSSES IN TRANSPARENT CRYSTALS USING THE TECHNIQUE OF CALORIMETRIC ABSORPTION SPECTROSCOPY. THESE TWO FACILITIES WILL THEN BE USED TO OPTIMIZE THE MOLAR CONCENTRATION OF MgO IN LiNbO(3) FOR MINIMUM SCATTERING AND ABSORPTION LOSSES AND MAXIMUM PHOTOREFRACTIVE OPTICAL DAMAGE THRES-

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HOLD. INITIALLY, GROWTH ALONG THE Z-AXIS WILL BE OPTIMIZED. WE WILL THEN ATTEMPT TO OPTIMIZE GROWTH PERPENDICULAR TO THE Z-AXIS WITH THE OPTIMIZED MgO CONCENTRATION. THE TECHNIQUES WE WILL HAVE DEVELOPED ARE QUITE GENERAL AND CAN BE USED TO OPTIMIZE THE GROWTH OF ANY TRANSPARENT CRYSTAL.

LB&M ASSOCS INC ARMY
111 "C" AVE - STE 200
LAWTON, OK 73501
CONTRACT NUMBER:
DR JOSEPH E HALLORAN III
TITLE:
CORPS OPERATIONS DECISION AID (CODA)
TOPIC# 50 OFFICE: CECOM/AMSEL

THIS PROJECT WILL DESIGN AND DEVELOP THE KNOWLEDGE BASE AND INFERENCE ENGINE NECESSARY TO IMPLEMENT A DECISION AID WHICH ASSISTS THE CORPS G3 SYNCHRONIZE CURRENT CORPS OPERATIONS. THE PHASE I EFFORT LED TO THE DEFINITION OF A TECHNICALLY FEASIBLE DECISION AID BASED ON DOCTINALLY CORRECT MODULES INVESTIGATING THE MAJOR THRESHOLDS OF CORPS COMBAT SUCCESS. THE PHASE II TECHNICAL APPROACH ENCOMPASSES A KNOWLEDGE ACQUISITION AND VALIDATION EFFORT BASED ON PERSONAL CONSTRUCT THEORY; A FUNCTIONAL REQUIREMENTS ANALYSIS EFFORT BASED ON A SYSTEMATIC DEFINITION OF THE TARGET SYSTEM'S MAJOR INFERENCE MECHANISM WHICH HAS PROVED SUCCESSFUL IN OTHER DECISION SUPPORT AND COMMAND AND CONTROL SYSTEM DESIGN EFFORTS, AND A KNOWLEDGE BASE CONSTRUCTION EFFORT USING OBJECT-ORIENTED DESIGN AND SYMMETRICAL RULE CONSTRUCTION. SUBSTANTIVE KNOWLEDGE WILL BE INCREASED THROUGH THE DETAILED DEFINITION OF THE MILITARY DECISION-MAKING PROCESS. METHODOLOGICAL ADVANCEMENT WILL BE ACHIEVED THROUGH A METHODOLOGY WHICH ACCURATELY DEFINES OPERATIONAL PROCESSES AND DATA FLOWS. TECHNICAL INNOVATION WILL BE ACHIEVED THROUGH THE PROTOTYPING OF A LARGE, HYBRID SYSTEM ON A MICROCOMPUTER.

LEHRER-PEARSON INC AF
1175 KOTTINGER DR
PLEASANTON, CA 94566
CONTRACT NUMBER: F33615-87-C-5329
J W PEARSON
TITLE:
EVALUATING MICROMACHINED GaAs WAFERS
TOPIC# 152 OFFICE: AFWAL/ML

SUBMITTED BY DEPT

THE PHASE I EFFORT RESULT IN MICROMACHINED GaAs WAFERS WITH 200 ANGSTROM PEAK-TO-VALLEY SURFACE FINISH, POSITIVE ELECTRICAL CHARACTERISTICS, AND ONE MICROMETRE OR LESS DEPTH OF CRYSTAL DAMAGE. A STATE-OF-THE-ART PLANAR CUTTING MACHINE WILL IMPROVE THESE RESULTS. FUNCTIONAL PERFORMANCE COMPARING SIMPLE FET CIRCUITRY ON MICROMACHINED AND CONVENTIONAL WAFERS WILL INDICATE POSSIBLE YIELD IMPROVEMENT. A 0.5 MICROMETRE DEPTH OF CUT INDICATES PROMISING MATERIAL REMOVAL CONTROL DURING BACKSIDE THINNING WITHOUT THREATENING FLATNESS AND PARALLELISM.

LEXIKOS CORP AF
69 HEATH RD
NORTH ANDOVER, MA 01845
CONTRACT NUMBER:
DANIEL W CORWIN
TITLE:
NEW CONCEPTS AND INNOVATIONS FOR AERONAUTICAL SYSTEMS/SUBSYSTEMS
TOPIC# 94 OFFICE: ASD/XR

IN PHASE I WORK ON THIS TOPIC, LEXIKOS DEMONSTRATED PROTOTYPE "TRANSCRIBER" SOFTWARE. WITH OPERATOR AID, IT CAN ISOLATE, MODEL, AND RELATE THE CENTRAL TOPICS OF WELL-FORMED ENGLISH TEXT, THEN OUTPUT THIS DATA INTO A TEXT FILE WRITTEN IN A FORMAL MODELING LANGUAGE CALLED INGLISH ("IDEALIZED ENGLISH"). INGLISH OUTPUTS FROM THE TRANSCRIBER GIVE A DETAILED LINGUISTIC MODEL OF THE INPUT TEXT AND ACCURATELY DEPICT MEANINGS FOR ITS INDIVIDUAL WORDS AND PHRASES. WHEN THEY ARE USED AS A DATA BASE OR KNOWLEDGE BASE BY EXTERNAL APPLICATIONS SOFTWARE, THE TOPICS AND SURFACE ASSERTIONS OF THE ORIGINAL TEXT BECOME "UNDERSTANDABLE" TO THAT APPLICATION SOFTWARE, AND THEY CAN BE USED TO HELP INTELLIGENTLY GUIDE ITS OWN SEPARATE ACTIVITIES AND DECISION-MAKING. FOR PHASE II, LEXIKOS PROPOSES TO EXPAND OUR CURRENT PROTOTYPE TRANSCRIBER INTO A FULL SCALE BETA-SITE VERSION, ORGANIZED TO HELP THE AIR FORCE MODEL, QUERY INDEX, CORRELATE, SUMMARIZE, REORGANIZE, AND REDISTRIBUTE BULK TEXTUAL DATA FOUND WITHIN THE CLASS OF DOCUMENT KNOWN AS TECHNICAL ORDERS.

LIGHTWAVE ELECTRONICS CORP SDIO
897-4A INDEPENDENCE AVE
MOUNTAIN VIEW, CA 94043
CONTRACT NUMBER:
RICHARD W WALLACE
TITLE:
RANGE MEASUREMENT WITH A LASER DIODE PUMPED Q-SWITCHED SOLID STATE LASER
TOPIC# 3 OFFICE:

SUBMITTED BY DEPT

THIS PROPOSAL IS TO STUDY AND DEVELOP LASER COMPONENTS WHICH COULD BE USED WITHIN A LASER SYSTEM FOR MEASURING THE RANGE AND RATE OF CHANGE IN RANGE (RANGE RATE) OF OBJECTS. THE MEASUREMENT SYSTEM WILL BE STUDIED AND RESEARCH WILL BE PERFORMED ON LASER-DIODE PUMPED Q-SWITCHED LASER OSCILLATORS AT 1.06 MICRONS BASED AROUND THE RESULTS OF THE SYSTEM EVALUATION. MINIATURE LASER DIODE PUMPED Nd:YAG LASERS HAVE RECENTLY BEEN BUILT THAT ALLOW COHERENT DETECTION TO BE USED IN RANGE MEASUREMENT. THESE LASERS HAVE NOT BEEN Q-SWITCHED. Q-SWITCHED OPERATIONS FIVE SHORT PULSES OF LIGHT THAT ARE APPROPRIATE FOR VERY SIMPLE INCOHERENT RANGING SYSTEMS. THE PROPOSED RESEARCH WILL LEAD TO A HIGH REPETITION RATE Q-SWITCHED MINIATURE LASER THAT CAN BE USED IN CONJUNCTION WITH A LASER AMPLIFIER OR DIRECTLY AS A SOURCE IN LASER MEASUREMENT OF RANGE AND RANGE RATE. THE INHERENT ADVANTAGES OF THIS TYPE OF OPTICAL SOURCE INCLUDE RUGGEDNESS, LONG LIFE, SMALL SIZE AND LOW COST. PHASE I WORK WAS BE DEVOTED TO EVALUATION AND CONCEPTUAL DESIGN OF THE SYSTEM AND EVALUATION AND PRELIMINARY DESIGNS OF THE MINIATURE Q-SWITCHED LASER.

LJF CORP ARMY
411 S LONDON AVE
S EGG HARBOR CITY, NJ 08215
CONTRACT NUMBER:
JOHN L MEAGHER
TITLE:
INTERFACE AND DIGITAL RECORDING ELECTRONICS FOR AIRBORN TEST SYSTEM
TOPIC# 70 OFFICE: CECOM/AMSEL

DESIGN AND DEVELOPMENT OF SPECIAL INTERFACES, HARDWARE AND SOFTWARE, TO BE USED BETWEEN THE INSTRUMENTATION COMPLEMENT OF THE ARMY'S ASSET MULTI-SENSOR FUSION TEST BED AND A VARIETY OF SENSORS, INSTRUMENTS, TARGET RECOGNIZERS AND TARGET TRACKERS.

LNR COMMUNICATIONS INC AF
180 MARCUS BLVD
HAUPPAUGE, NY 11788
CONTRACT NUMBER:
H deGRUYL
TITLE:
THEMALLY COOLED EHF LOW NOISE AMPLIFIED FOR SPACECRAFT APPLICATION
TOPIC# 65 OFFICE: AFSTC/OLAB

SUBMITTED BY DEPT

A NEED EXIST FOR SPACE QUALIFIED EHF LOW NOISE RECEIVER FRONT-ENDS OPERATING AT FREQUENCIES OF 44 GHz AND UP. RECENT ADVANCES IN THE AREA OF HEMT DEVICE TECHNOLOGY MAKE IT POSSIBLE TO DEVELOP A SPACE QUALIFIABLE LOW NOISE AMPLIFIER WITH GAIN AND NOISE FIGURE PERFORMANCE APPROACHING THAT PREVIOUSLY AVAILABLE ONLY WITH PARAMETRIC AMPLIFIERS. TO ACHIEVE THESE NOISE PERFORMANCE LEVELS IT IS HOWEVER NECESSARY TO COOL THE HEMT DEVICE THEREBY REDUCING ITS THERMAL NOISE CONTRIBUTION. ACCORDINGLY, AN SBIR PHASE I STUDY PROGRAM HAS BEEN COMPLETED WHICH HAS RESULTED IN THE GENERATION OF A TOP LEVEL PAPER DESIGN OF A SPACE QUALIFIABLE, THERMOELECTRICALLY COOLED 44 GHz HEMT LNA AND AN ASSOCIATED EHF HEMT DEVICE DATA BASE. BASED UPON THE RESULTS OF THIS PROGRAM, A 24 MONTH SBIR PHASE II PROGRAM IS PROPOSED TO PERFORM THE DETAILED DESIGN EFFORT AND ACTUALLY FABRICATE AND TEST A PROOF OF CONCEPT (POC) MODEL OF A THERMOELECTRICALLY COOLED EHF HEMT LNA. THE PROPOSED 44 GHz HEMT LNA WILL BE LIGHTWEIGHT, SPACE-QUALIFIABLE AND CONFIGURED TOWARD A NOISE FIGURE OF 3 TO 3.5 dB, COUPLED WITH 20 dB MINIMUM GAIN OVER A 2 GHz BANDWIDTH.

MAINTENANCE REQUIREMENTS INC NAVY
76 SOUTHWOOD DR
ORINDA, CA 94563
CONTRACT NUMBER:
EPHRAIM REGELSON
TITLE:
APPLICATION OF ROBOTICS TECHNOLOGY TO REPAIR OF ELECTRONIC PRINTED CIRCUIT BOARDS
TOPIC# 101 OFFICE: NSWC/SSPO

IN THIS PHASE II EFFORT MAINTENANCE REQUIREMENTS INC. (MRI) PROPOSES TO DEVELOP AND DEMONSTRATE HARDWARE TO APPLY ROBOTIC AND AUTOMATION TECHNOLOGIES TO THE REPAIR OF ELECTRONIC PRINTED CIRCUIT CARDS. MRI WILL DEVELOP AND PERFECT TECHNIQUES, HARDWARE, AND SOFTWARE THAT WILL AUTOMATICALLY REMOVE CONFORMAL COATINGS FROM ELECTRONIC PRINTED CIRCUIT BOARDS. IT WILL CONDUCT EXPERIMENTS AUTOMATING THE REMOVAL OF-DEFECTIVE DUAL-IN-LINE PACKAGED COMPONENTS FROM ELECTRONIC PRINTED CIRCUIT BOARDS. A PROTOTYPE SYSTEM WILL BE DEVELOPED AND BUILT TO DEMONSTRATE ALL OF THE CONCEPTS INVOLVED IN CONFORMAL COATING REMOVAL. THE PROTOTYPE UNIT WILL BE DESIGNED TO OPERATE SAFELY, RELIABLY, AND EFFECTIVELY AT MILITARY AND COMMERCIAL ELECTRONIC REPAIR DEPOTS. IF COMPONENT REMOVAL EXPERIMENTS ARE FAVORABLE, TECHNIQUES TO DO THIS

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WILL BE INCORPORATED INTO THE SYSTEM. THE TECHNICAL WORK AND FIELD EVALUATIONS PERFORMED WILL SERVE AS A BASIS FOR A PHASE III EFFORT TO AUTOMATE ELECTRONIC PRINTED CIRCUIT BOARD REPAIR PROCESSES AT A GREATER MANY MILITARY AND COMMERCIAL ELECTRONIC MAINTENANCE ACTIVITIES.

MANATECH ASSOCS ARMY
PO BOX 37 - 824 N MAIN ST
BELLEFONTAINE, OH 43311
CONTRACT NUMBER:
BRYAN L GLETT
TITLE:
ACTIVE MOUNTINGS FOR CRYSTAL PHASE NOISE REDUCTION
TOPIC# 89 OFFICE: LABCOM/ETDL

PROPOSED PROJECT TO DEVELOP THE PREVIOUSLY DEMONSTRATED FEASIBILITY OF USING COMPACT ARRANGEMENTS OF ACTIVE PIEZOELECTRIC ISOLATION DEVICES AS MOUNTINGS FOR CRYSTALS AND CRYSTAL OSCILLATORS. PROJECT WILL REFINE DRIVE METHODS TO IMPROVE PERFORMANCE, MODEL PERFORMANCE FOR DESIGN IMPROVEMENT, ATTEMPT TO OPTIMIZE ALL DESIGN PARAMETERS TO BEST MEET CRITERIA, AND DESIGN AND BUILD A WORKING SYSTEM FOR EVALUATION, SUITABLE FOR INSTALLATION IN FREQUENCY SYSTEMS. TO ACCOMPLISH THIS, THE TRANSIENT AND FREQUENCY BEHAVIOR OF THE DEVICE WILL BE MORE FULLY MODELED, THE REQUIREMENTS FOR MORE EFFICIENT AND LINEAR DRIVE STRUCTURED, AND VARIOUS DESIGN ENHANCEMENTS MADE BEYOND THE PROTOTYPE TESTED IN PHASE I.

MANDEX INC NAVY
8003 FORBES PL
SPRINGFIELD, VA 22151
CONTRACT NUMBER: N00039-88-C-0175
JOSEPH A FAULKNER
TITLE:
ICE THICKNESS MEASURMENT METHOD
TOPIC# 38 OFFICE: SPAWAR

THE PROPOSED CONCEPT FOR MEASURING ICE THICKNESS FROM A SUBMARINE IS FUNCTIONALLY SIMILAR TO THE BQS-15 IN THAT IT MEASURES THE HYDROSTATIC PRESSURE AT THE SUBMARINE AND THE UPWARD DISTANCE TO THE

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UNDERSURFACE OF THE ICE. THE PRESSURE IS DUE TO THE WEIGHT OF THE WATER COLUMN PLUS THAT OF THE ICE; SO, FROM THE TWO MEASUREMENTS, THE WEIGHT AND HENCE THE ICE THICKNESS CAN BE COMPUTED. HOWEVER, RATHER THAN USING AN UPWARD PING TO FIND THE DISTANCE TO THE ICE, WE PROPOSE TO USE THE RADIATED NOISE OF THE SUBMARINE BY CORRELATING THE RE-FLECTED NOISE WITH THE TRANSMITTED NOISE. PRELIMINARY CALCULATIONS INDICATE THAT IN THE ABSENCE OF LOUD ICE CRACKING NOISES OR PRESSURE RIDGES THIS RADIATED NOISE IS SUFFICIENTLY LOUD FOR THE PURPOSE. THE PHASE I EFFORT MODELED THE ACOUSTICS AND THE SIGNAL PROCESSING AND MADE CERTAIN PERFORMANCE PREDICTIONS BASED UPON ASSUMPTIONS ABOUT THE SUBMARINE'S RADIATED NOISE AND ACOUSTIC SPECTRUM. THE ANALYSIS PERFORMED IN PHASE I SHOWED THAT SUCH A SYSTEM IS FEASIBLE. THE PHASE II EFFORT WILL REFINE THE ANALYSIS PERFORMED IN PHASE I, PROVIDE AN ERROR ANALYSIS OF THE ICE THICKNESS MEASURMENTS, ASSEMBLE EQUIPMENT TO CONDUCT A SEA TEST AND TO ANALYZE EXISTING AND NEW TAPE RECORDINGS, AND CONDUCT TWO SEA TESTS.

MARITIME DYNAMICS INC NAVY
RR 4 - BOX 424X
LEXINGTON PARK, MD 20653
CONTRACT NUMBER:
A W ERNEST
TITLE:
NAVY SURFACE EFFECT SHIP (SES) SEAKEEPING ASSESSMENT
TOPIC# 187 OFFICE: DTRC/NAVSEA

A FREQUENCY-DOMAIN COMPUTER PROGRAM WAS DEVELOPED AND VALIDATED UNDER A PHASE I SBIR PROJECT FOR PREDICTING STATISTICAL MOTION PARAMETERS FOR VARIOUS SES CONFIGURATIONS AND OPERATING CONDITIONS. THE PHASE II EFFORT WILL EXTEND AND UPGRADE THIS COMPUTER PROGRAM. A COMPREHENSIVE RIDE CONTROL SYSTEM (RCS) MODEL WILL BE INCORPORATED, SINCE DEVELOPMENT AND IMPLEMENTATION OF EFFECTIVE RIDE CONTROL HAS BEEN AN IMPORTANT FEATURE OF SUCCESSFUL MILITARY AND COMMERCIAL SES DESIGNS. ROUTINES WILL ALSO BE ADDED FOR SELECTION AND EVALUATION OF SEAKEEPING-RELATED DESIGN FEATURES SUCH AS FAN CHARACTERISTICS, VENT VALVE SIZING, AND RCS HYDRAULIC SYSTEM SIZING.

MARTIN ANALYSIS SOFTWARE TECHNOLOGY INC NAVY
2627 BURGENER BLVD
SAN DIEGO, CA 92110
CONTRACT NUMBER: N66001-87-C-0478
DR GORDON E MARTIN
TITLE:
PERSONAL COMPUTER (PC) CAE OF UNDERWATER TRANSDUCERS AND ARRAYS
TOPIC# 178 OFFICE: NOSC/NAVSEA

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PC-CAE WILL BE DEVELOPED TO IMPROVE SIGNIFICANTLY R&D OF UNDERWATER ACOUSTIC TRANSDUCERS AND ARRAYS. INCREASED PRODUCTIVITY WILL BE ACHIEVED BY EXPLOITING MODIFIED AND NEW MATHEMATICAL MODELS, HIGH-PERFORMANCE LOW-COST PERSONAL COMPUTERS, AND COMPUTER GRAPHICS. USER-FRIENDLY SOFTWARE WILL FACILITATE USE BY DESIGN SCIENTISTS, PRODUCTION TECHNICIANS, AND MANAGERS. SOFTWARE WILL INCORPORATE RECENT FEATURES FOR TRANSDUCER DESIGN AND MATERIAL-PARAMETER EVALUATIONS USING PIEZOELECTRIC RINGS AND OTHER TECHNIQUES TO ACHIEVE UNIFORM TRANSDUCERS IN PRODUCTION. ARRAY PERFORMANCE PROGRAMS WILL HAVE SPECIAL ALGORITHMS FOR TOEPLITZ MATRICES WITH SOLUTIONS OF ELEMENT'S ELECTROACOUSTIC VARIABLES. SYSTEM DESIGN AND ANALYSIS SIMULATION IS PROVIDED, FOLLOWED BY BEAMFORMER AND SIGNAL PROCESSING FUNCTIONS. NEW MEASUREMENT TECHNIQUES WILL PROVIDE SUPERIOR CHARACTERIZATION OF MATERIALS. DEVELOPMENT OF PREPROGRAMMED, USER-FRIENDLY PC-CAE UNITS WILL INCREASE INDIVIDUAL PRODUCTIVITY AND FACILITATE PERSONNEL TRAINING. PC-CAE CAN BE EXPANDED USING TRANSDUCER AND ARRAYS LIBRARIES OF SUBROUTINES SIMILAR OF EISPACK AND LINPACK LIBRARIES. PC-CAE CAN BE ADAPTED FOR OTHER ANALYSES SUCH AS ANTENNA ARRAYS, DONE USING PC-CAE MODULES FOR MANY SUBROUTINES. PC-CAE WILL ALLOW EXPERTS TO DEVELOP NEW SYSTEMS RAPIDLY, AND LESS-SKILLED PERSONS CAN PERFORM DESIGN AND ANALYSIS WITH EASY-TO-USE SOFTWARE.

MASSACHUSETTS TECHNOLOGY LAB (MTL) ARMY
312 AUSTIN AVE
WEST NEWTON, MA 02165
CONTRACT NUMBER:
DR DICKSON FANG
TITLE:
DEVELOPMENT OF PROPAGATION TOOLS FOR THE PLANNING AND IMPLEMENTATION OF THE ARMY 21 SYSTEM
TOPIC# 47 OFFICE: CECOM/AMSEL

THE WORK IS FOR THE DEVELOPMENT OF EM PROPAGATION ASSESSMENT TOOLS TO BE READILY USEFUL FOR SYSTEM ENGINEERS IN PLANNING AND IMPLEMENTING THE C3 AND DATA TRANSMISSION SYSTEMS UNDER THE ARMY 21 CONCEPT. THE TOOLS WILL BE CONFIGURATED LIKE THAT OF A BLACK BOX IN WHICH ALL THE PROPAGATION INFORMATION IS PACKED. TOOLS WILL BE MOSTLY IN THE FORM OF SOFTWARE PROGRAMS PACKAGED ON FLOPPY DISKS FOR IBM PC AT/XT COMPUTERS (OR OTHER TYPES OF MICRO-COMPUTERS, DESIGNATED BY CECOM).

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OTHERWISE, TOOLS MAY BE IN FORMS OF QUICK-LOOK RULES, PROCEDURES, GRAPHS, OR ARITHMETIC ALGORITHMS, WHICHEVER IS MOST APPROPRIATE. TOOLS SHALL BE EASY TO APPLY BY SYSTEM ENGINEERS AND TECHNICIANS WHO DO NOT HAVE MUCH PROPAGATION BACKGROUND. TOOLS COVER AT LEAST 4 FREQUENCY BANDS: HF, VHF, UHF AND SATELLITE BAND UP TO 30 GHZ.

MATERIAL CONCEPTS INC NAVY
666 N HAGUE AVE
COLUMBUS, OH 43204
CONTRACT NUMBER:
DR DAVID M GODDARD
TITLE:
CERAMIC REINFORCEMENT FOR METAL MATRIX COMPOSITES DEVELOPMENT
TOPIC# 58 OFFICE: NAVSEA

HIGH PRESSURE CASTING PROVIDES AN ECONOMICAL METHOD FOR PRODUCING NET SHAPE METAL MATRIX COMPOSITE PIECEPARTS. NEARLY ANY FIBER COMPOSITION, LENGTH, OR ORIENTATION CAN BE INCORPORATED IN A METAL MATRIX BY THIS PROCESS. THE OBJECTIVE OF THIS PROGRAM IS TO CONTINUE THE RESEARCH BEGUN UNDER PHASE I, BY PRODUCING AND CHARACTERIZING A WIDER VARIETY OF FIBER/MATRIX COMBINATIONS. POTENTIAL NAVAL APPLICATIONS FOR MATERIALS PRODUCIBLE BY THIS PROCESS WILL BE ASSESSED AND IDENTIFIED, AND ADDITIONAL MATERIAL PROPERTIES PERTINENT TO THESE APPLICATIONS WILL BE MEASURED. AS A FINAL EFFORT, A PROTOTYPE METAL COMPOSITE PIECEPART, REPRESENTING AN IDENTIFIED NAVAL APPLICATION, WILL BE PRODUCED AND CHARACTERIZED.

MATERIALS INNOVATION LABS AF
7384 "A" TRADE ST
SAN DIEGO, CA 92122
CONTRACT NUMBER: F33615-87-C-3252
KENNETH H HOLKO
TITLE:
DEVELOPMENT AND STRUCTURAL APPLICATION OF CARBON-CARBON JOINING TECHNOLOGY
TOPIC# 124 OFFICE: AFWAL/FI

MATERIALS INNOVATION LABORATORIES (M.I.L.) HAS DEVELOPED METHODS FOR HIGH TEMPERATURE BRAZING AND DIFFUSION WELDING CARBON-CARBON COM-

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POSITES (CCC). THESE METHODS PRODUCE JOINTS WHICH CAN POTENTIALLY OPERATE WITH GOOD MECHANICAL STRENGTH TO AT LEAST 3000 DEG F. IN A SUCCESSFUL PHASE I AFWAL STUDY UNDER CONTRACT F33615-86-C-3223, M.I.L. TESTED A VARIETY OF JOINTS IN CCC. TESTS INCLUDED EXAMINATIONS BY OPTICAL METALLOGRAPHY, SCANNING ELECTRON MICROSCOPY (SEM) AND ENERGY DISPERSIVE ANALYSIS BY X-RAY (EDX), AND SIMPLE BEND AND MICROHARDNESS TESTS. SOME OF THE BRAZING MATERIALS DEEPLY PENETRATED INTO SURFACE CONNECTED CRACKS AND PRODUCED STRONGLY ADHERENT SURFACE COATINGS ON THE CCC. TO FURTHER DEVELOP THE PHASE I TECHNOLOGY, M.I.L. HAS PROPOSED A PHASE II STUDY TO OPTIMIZE THE INTERLAYER MATERIALS AND JOINING TECHNIQUES; TO PERFORM MECHANICAL SCREENING AND ENGINEERING PROPERTY TESTING AT TEMPERATURES OF 3000 DEG F; TO BUILD A DEMONSTRATION PROPOTYPE FLIGHT ARTICLE FOR THERMO-STRUCTURAL EVALUATION; AND TO SCREEN SOME OF THESE JOINING MATERIALS AS ELEVATED TEMPERATURE CCC COATINGS. THE PHASE II EFFORT WILL MOVE THIS JOINING AND COATING TECHNOLOGY TOWARD COMMERCIALIZATION IN A PHASE III EFFORT.

MATERIALS RELIABILITY INC NAVY
PO BOX 949
NAPERVILLE, IL 60566
CONTRACT NUMBER:
JOSEPH S SANTER
TITLE:
MATRIX ALLOY DESIGN FOR TOUGHENING DISCONTINUOUS REINFORCED COMPOSITES
TOPIC# 111 OFFICE: NSWC/SSPO

PHASE II OBJECTIVES ARE TO PRODUCE Al/SiC COMPOSITES WHICH MAINTAIN THE GOOD DUCTILITY AND MODULUS MEASURED IN PHASE I, BUT TO INCREASE THE CRACK GROWTH TOUGHNESS AND STRENGTH. SEVERAL INTERRELATED VARIABLES WILL BE EVALUATED: 1) THE TYPE OF SiC REINFORCEMENT (ALPHA VS BETA PHASE), 2) THE AVERAGE SiC SIZE AND BLENDS OF DIFFERENT SIZES, 3) THE EFFECT OF PRESSURE CASTING ON BILLET PRODUCTION, AND 4) THERMO-MECHANICAL PROCESSING TO PRODUCE AN UNRECRYSTALLIZED OR PARTIALLY RECRYSTALLIZED MATRIX. PHASE II WILL CONCENTRATE ON PRIMARY BILLET PRODUCTION AND PRIMARY PROCESSING CONDITIONS SINCE EXISTING DATA SUGGESTS PROCESSING PLAYS A CRUCIAL ROLE IN DEVELOPING GOOD MECHANICAL PROPERTIES IN DISCONTINUOUS COMPOSITES SIMILAR TO MONOLITHIC ALLOYS. FOUR MATRIX ALLOYS WILL BE USED TO PRODUCE COMPOSITES WITH DIFFERENT AVERAGE PARTICLE SIZES OF FCC SiC AND HCP SiC. BOTH CONVENTIONAL

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AND PRESSURE CASTING WILL BE USED TO PRODUCE BILLETS. THESE BILLETS WILL BE THERMOMECHANICALLY PROCESSED TO DEVELOP AN UNRECRYSTALLIZED MATRIX. BOTH EXTRUSIONS AND PLATE WILL BE PRODUCED AND TESTED FOR MODULUS, STRENGTH, AND TOUGHNESS TO ASSURE PHASE II PROPERTY GOALS ARE ACHIEVED. THREE OF THE MOST PROMISING SYSTEMS WILL BE CHOSEN, AND THE OPTIMIZED THERMOMECHANICAL PROCESSING UTILIZED. ADDITIONAL TENSILE AND FRACTURE TOUGHNESS TESTS WILL DETERMINE IF THE PHASE II STRENGTH (50 KSI) AND TOUGHNESS (25 KSI IN,) GOALS ARE ACHIEVED.

MAXIM TECHNOLOGIES INC NAVY
3930 FREEDOM CIRCLE - STE A
SANTA CLARA, CA 95054
CONTRACT NUMBER: N00039-88-C-0106
JOHN R CONKLE
TITLE:
ACCELERATED ADVANCED PROPHET
TOPIC# 32 OFFICE: SPAWAR

ADVANCED PROPHET (AP) IS AN EFFECTIVE SOFTWARE TOOL FOR HF PROPAGATION PREDICTION. ITS CONVERSION TO THE MS-DOS ENVIRONMENT HAS MADE ITS CAPABILITY AVAILABLE TO A VERY LARGE USER BASE. THE PRIMARY OBJECTIVE OF THIS PROPOSAL IS TO SIGNIFICANTLY DECREASE THE EXECUTION TIME OF THE PROGRAM. THE DEVELOPMENT OF ACCELERATED ADVANCED PROPHET (AAP) WILL BE ACCOMPLISHED USING THE SAME HARDWARE AND SOFTWARE TECHNIQUES THAT WERE SUCCESSFULLY USED IN THE PHASE I PROGRAM. IN THAT PROGRAM, THE EXECUTION TIME OF A SINGLE POINT PAIR CALCULATION IN MINIMUF-85 WAS REDUCED TO 4.93 ms. AAP WILL BE RUN ON A 68020/68881-BASED PERIPHERAL PROCESSOR CARD WHICH WILL OCCUPY ONE SLOT IN AN IBM PC (OR COMPATIBLE). THE AP PROGRAM WILL BE REORGANIZED TO TAKE ADVANTAGE OF PARALLEL PROCESSING. THE HOST PROCESSOR WILL BE UTILIZED FOR I/O PROCESSING; THE PERIPHERAL PROCESSOR FOR APPLICATION COMPUTIONS. SPECIFIC MODULES WILL BE OPTIMIZED AND THEN REWRITTEN IN ASSEMBLY LANGUAGE TO FURTHER DECREASE THE EXECUTION TIME.

MAYFLOWER COMMUNICATIONS CO INC ARMY
384 LOWELL ST - STE 105 A
WAKEFIELD, MA 01880
CONTRACT NUMBER:
DR DUNCAN B COX JR
TITLE:
MILWATCH DEVELOPMENT AND DEMONSTRATION
TOPIC# 88 OFFICE: LABCOM/ETDL

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THE MAIN OBJECTIVE OF THIS PROJECT IS TO DEVELOP AND DEMONSTRATE A WORKING MODEL OF A HIGHLY PRECISE AND AUTOMATED MILITARY WATCH (MILWATCH) FOR A HIGH-ACCURACY TIME TRANSFER. THE DEMONSTRATION WILL VALIDATE THE CONCEPT FOR USE IN UPDATING CLOCKS ASSOCIATED WITH CERTAIN RADIO SYSTEMS. DESIGN AND TEST DATA FROM THIS PROGRAM WILL ALLOW ACCURATE PLANNING AND COSTING OF A PRODUCTION PROGRAM.

MEASUREMENT CONCEPTS INC ARMY
41 HWY 34 SOUTH - COLTS TOWNE PLAZA
COLTS NECK, NJ 07722
CONTRACT NUMBER:
DR EDWARD COLLET
TITLE:
DIGITAL REFRACTOMETRY OF PIEZOELECTRIC CRYSTALLINE MEDIA
TOPIC# 84 OFFICE: LABCOM/ETDL

THIS PROPOSAL DESCRIBES A PHASE II DOD SBIR PROGRAM TO CONTINUE AND EXPAND A NOVEL TECHNIQUE FOR MEASURING THE REFRACTIVE INDICES OF UNI-AXIAL (PIEZOELECTRIC) CRYSTALS. DURING PHASE I WE DEVELOPED AND IM-PROVED THIS METHOD WHICH WE CALL DUAL-BEAM DIGITAL REFRACTOMETRY. BY FOLLOWING A DUAL-BEAM CONFIGURATION WE SHOW THAT IT IS POSSIBLE TO OVERCOME 1) THE OPTICAL SOURCE FLUCTUATIONS, 2) THE DETECTOR SENSI-TIVITY OVER A SPECTRAL RANGE AND 3) OBTAIN THE THEORETICAL LIMIT OF ACCURACY. THE PROPOSED EXPERIMENTAL CONFIGURATION IN PHASE II CON-TAINS NO MOVING PARTS. A MATHEMATICAL ANALYSIS OF DIGITAL REFRACTO-METRY IS MADE ALONG WITH AN ANALYSIS OF THE EXPERIMENTAL CONFIGURA-TION.

MEASUREMENT TECHNOLOGY NORTHWEST AF
2929 NE BLAKELEY ST
SEATTLE, WA 98105
CONTRACT NUMBER: F33615-87-C-3248
DR PETER B ZIEVE
TITLE:
DEVELOPMENT OF AN ALUMINUM RIVET FOR USE ABOVE 500 DEG F
TOPIC# 145 OFFICE: AFWAL/FI

THE RESULTS OF MEASUREMENT TECHNOLOGY NORTHWEST'S (MTNW) PHASE I PROGRAM HAVE SIGNIFICANTLY NARROWED THE QUESTIONS WITH RESPECT TO

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THE PRACTICALITY OF Al-Fe-Ce RIVETS. MTNW HAS DEMONSTRATED THAT THESE RIVETS CAN BE FABRICATED AND INSTALLED. WHEN INSTALLED THEY EXHIBIT SUPERIOR STRENGTH AT ELEVATED TEMPERATURES IN COMPARISON WITH STANDARD HIGH STRENGTH ALUMINUM RIVETS. EXCELLENT RIVETS HAVE CONSISTENTLY BEEN INSTALLED ON A HYDRAULIC SQUEEZE PRESS. GOOD RIVET QUALITY HAS ALSO BEEN ACHIEVED WITH HAND BUCKING AND LOW VOLTAGE ELECTROMAGNETIC RIVETER IF THE RIVET HEADS ARE PREHEATED TO ABOUT 500 DEG F AT THE TIME OF INSTALLATION. WARM FORMING WAS NECESSARY TO OVERCOME THE LOW DUCTILITY AND FRACTURE TOUGHNESS CHARACTERISTIC OF THE AS RECEIVED STUDY MATERIAL. THE GOAL OF MTNW'S PHASE II IS TO DEVELOP THE Al-Fe-Ce RIVET INTO A TECHNICALLY AND COMMERCIALLY VIABLE FASTENER. TO MEET THIS GOAL MTNW PROPOSES TO ADDRESS MATERIAL DEVELOPMENT, RIVET PRODUCTION, RIVET INSTALLATION, AND MATERIAL AND RIVET TESTING. MTNW WILL CONDUCT RIVET INSTALLATION, TESTING, METALLURGICAL ANALYSIS, AND DEVELOPMENT EFFORTS IN INSTALLATION TECHNIQUES AND SECONDARY HEAT TREATMENT. ALCOA WILL BE SUBCONTRACTED TO CARRY OUT MATERIAL DEVELOPMENT TO YIELD A Al-Fe-Ce ALLOY OPTIMIZED FOR RIVETING. ALCOA HAS EXPRESSED CONFIDENCE IN DEVELOPING Al-Fe-Ce WIRE WITH ADEQUATE MALLEABILITY FOR ROOM TEMPERATURE HAND BUCKING. LOCKHEED-CALIFORNIA WILL SERVE AS A CONSULTANT THROUGHOUT THE PROGRAM, AND WILL BE SUBCONTRACTED TO CONDUCT INDEPENDENT TESTING AS A VERIFICATION OF MTNW'S RESULTS.

MERIDIAN CORP AF
4300 KING ST - STE 400
ALEXANDRIA, VA 22302
CONTRACT NUMBER: 87-15059
MARK D BRYFOGLE
TITLE:
AIRCRAFT MUNITIONS LOADING VIA A ROBOTIC MANIPULATOR UNDER CLOSED LOOP CONTROL
TOPIC# 29 OFFICE: AD/YNS

DURING PHASE I OF THIS PROGRAM, MERIDIAN CORPORATION DETERMINED THAT IT IS FEASIBLE TO APPLY AUTOMATION TO TACTICAL AIRCRAFT FLIGHT LINE MUNITIONS LOADING PROCEDURES. FURTHERMORE, THE PHASE I STUDY CONCLUDED THAT THIS APPLICATION OFFERS THE OPPORTUNITY TO REDUCE MANPOWER REQUIREMENTS AND DECREASE THE MUNITIONS LOADING TIME, THEREBY FACILITATING QUICKER AIRCRAFT SORTIE TURN-AROUND. IN PHASE II, MERIDIAN CORPORATION, WITH ASSISTANCE FROM THE NATIONAL BUREAU OF

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STANDARDS, WILL OPTIMIZE THE PHASE I APPROACH TO AUTOMATION BY RE-DESIGNING THE MJ1 MUNITIONS TRUCK LOADING HEAD TO PROVIDE THE MJ1 WITH SIX ACTIVE FREEDOMS, AND BY INSTALLING A CLOSED LOOP SENSOR FEEDBACK CAPABILITY TO ALLOW COMPUTER CONTROL OF THE SIX FREEDOMS. MERIDIAN CORPORATION WILL DEMONSTRATE CLOSED LOOP MUNITIONS LOADING THROUGH THESE TWO INNOVATIVE UPGRADES. ENGINEERING MODELS OF THE OPTIMUM LOADING HEAD AND CLOSED LOOP SENSOR SYSTEM WILL BE DESIGNED, CONSTRUCTED AND TESTED. THESE MODELS WILL THEN BE INTEGRATED WITH THE MJ1 MUNITIONS TRUCK SIMULATOR WITH A SYSTEM HIERARCHICAL CONTROLLER. THE INTEGRATED SYSTEM WILL BE TESTED TO VERIFY THE SYSTEM OPERATIONAL CAPABILITY.

MICRO-COATINGS INC AF
ONE LYBERTY WY
WESTFORD, MA 01886
CONTRACT NUMBER:
JOHN C SIMONS
TITLE:
HIGH RESOLUTION ULTRA VIOLET FILTER DEVELOPMENT
TOPIC# 72 OFFICE: AFGL/XOP

A PROGRAM IS PROPOSED TO DEVELOP A DESIGN AND MANUFACTURING TECHNOLOGY FOR PRODUCING OPTICAL INTERFERENCE FILTERS THAT CAN TRANSMIT ULTRAVIOLET IMAGES (SUCH AS MISSILE PLUMES) AND MAINTAIN HIGH IMAGE RESOLUTION WHILE REJECTING VISIBLE AND LONGER WAVELENGTH RADIATIONS. COMPARED TO FILTERS PRESENTLY USED, ULTARVIOLET IMAGE DEFINITION WILL BE SUBSTANTIALLY IMPROVED. COMPUTER-ASSISTED PRO-CEDURES FOR DESIGN OF REPRESENTATIVE FILTER TYPES WILL BE DEVELOPED TO SATISFY DESIRED SPECTRAL PERFORMANCE AND REJECTION. PROCEDURES WILL BE CONFIRMED BY DESIGN AND FABRICATION OF FILTERS FOR SPECIFIC APPLICATIONS, FOLLOWED BY FIELD EVALUATION. A TEST FACILITY FOR MEASURING RESOLUTION PERFORMANCE WILL BE ASSEMBLED AND EVALUATED. SPECIFICATION OBJECTIVES FOR RESOLUTION, SPECTRAL PERFORMANCE, AND OUT-OF-BAND REJECTION ARE EXPECTED TO BE ACHIEVED. OPTICAL DEPOSITION TECHNOLOGY WILL BE DETERMINED AND ESTABLISHED AS THE BASIS FOR SUBSEQUENT QUANTITY PRODUCTION.

MICROEXPERT SYSTEMS INC ARMY
21405 DEVONSHIRE BLVD - #219-220
CHATSWORTH, CA 91313
CONTRACT NUMBER:
PAUL GRIFFITH
TITLE:
MAINTENANCE TRAINER: AN EMBEDDED KNOWLEDGE BASED SYSTEM FOR EQUIPMENT REPAIR
TOPIC# 112 OFFICE: MICOM

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MAINTENANCE TRAINER IS AN EMBEDDED INTELLIGENT TUTORING SYSTEM FOR TEACHING TECHNICIANS HOW TO REPAIR THE HIGH VOLTAGE POWER SUPPLY OF THE HAWK MISSILE HIGH POWERED RADAR ILLUMINATOR. IT REPRESENTS THE SECOND PHASE OF AN EFFORT THAT BEGAN WITH A FEASIBILITY STUDY ON A SUBSYSTEM OF THE HIGH VOLTAGE SUPPLY. THE MAINTENANCE TRAINER COMPUTER CONTAINS FAULT ISOLATION PROCEDURES, QUESTION GENERATORS, CONTEXTUAL HELP, DEEP SYSTEM SIMULATIONS, AND SEVERAL KINDS OF GRAPHIC SUPPORT--ALL INTEGRATED BY EXPERT SYSTEM TECHOLOGY. THE USER WORKS THROUGH A TROUBLESHOOTING SEQUENCE IN A DIALOQUE WHICH ASKS QUESTIONS ABOUT THE PROCEDURES, THEORY, TOOLS, SAFETY ISSUES, AND GOALS OF THE TASK. COMPLEX WINDOWING PUTS PANEL EMULATIONS, FAULT SIMULATIONS, SCHEMATICS, BLOCK DIAGRAMS, FLOW CHARTS, AND VERBAL EXPLANATIONS AND EXAMPLES AT HIS/HER FINGERTIPS. BY COMPILING, ANALYZING, AND MAINTAINING INDIVIDUAL USER PROFILES, MAINTENANCE TRAINER CAN SHAPE REMEDIATION TO INDIVIDUAL USER NEEDS AND LEARNING STYLES, PROVIDE SOPHISTICATED AND SENSITIVE HELP, AND ALLOW FOR USER EXPLORATIONS AND DISCOVERY LEARNING. MAINTENANCE TRAINER'S TECHNIQUES MAXIMIZE THE DYNAMISM AND HENCE IMPACT OF ITS USER INTERACTIONS.

MICROEXPERT SYSTEMS INC NAVY
24007 VENTURA BLVD - #210
CALABASA, CA 91302
CONTRACT NUMBER:
PAUL GRIFFITH
TITLE:
PLANNERS' WORKBENCH: AN EXPERT SYSTEM FOR CABLE ASSEMBLY PLANNING
TOPIC# 150 OFFICE: NWSC

PLANNERS' WORKBENCH WILL APPLY EXPERT SYSTEM TECHNOLOGY TO SOLVING PROBLEMS FACED BY CAPABLE HARNESS ASSEMBLY PLANNERS, EXTENDING AN EARLIER LIMITED APPLICATION TO THE ENTIRE CABLE BUILDING PROCESS. A SELF-CONTAINED SET OF SOFTWARE TOOLS, IT WILL COMPUTERIZE AND AUTOMATE THE PROCESS. PLANNERS' WORKBENCH WILL INPUT DESIGN AND MANUFACTURING DATA FROM CAD AND OTHER COMPUTER SOURCES INTO A DATABASE ORGANIZED USING OBJECT ORIENTED LANGUAGE AND FRAMES. IT WILL ADDRESS SPECIFIC PLANNING PROBLEMS THROUGH RULE BASED INFERENCING GROUNDED IN THE EXPERIENCE OF EXPERT MANUFACTURING ENGINEERS. IT WILL OUTPUT PLANS AND MANUFACTURING INSTRUCTIONS NECESSARY TO PRODUCE THE CABLE.

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FEATURES OF PLANNERS' WORKBENCH INCLUDE CUSTOMIZATION TO THE CLIENT'S SPECIFIC PROCESS NEEDS, COMPLETE COMPUTERIZATION OF THE PLANNER'S FUNCTION, AUTOMATIC AND USER CONTROLLED GRAPHIC SEQUENCE ANIMATION, ABILITY TO HANDLE COMPLEX PROCESSES AND TO VARY INPUT CONDITIONS FOR "WHAT IF" SCENARIOS, SENSITIVITY TO CURRENT PLANNING DEPARTMENT WORKWAYS, AND A GROWTH PATH TOWARD A STAND-ALONE MANUFACTURING ENGINEER'S WORKSTATION. ITS NOVEL METHODS OF KNOWLEDGE ENGINEERING INCORPORATE THE INSIGHTS OF ANTHROPOLOGISTS AND PSYCHOLOGISTS FOR OPTIMIZING KNOWLEDGE ENGINEERING. PLANNERS' WORKBENCH WILL BE APPLIED TO THE CABLE ASSEMBLY PROCESS OF LOCKHEED'S TRIDENT MISSILE MANUFACTURING GROUP.

MILLIMETER WAVE TECHNOLOGY INC (MWT) ARMY
1395 MARIETTA PKWY - BLDG 700
MARIETTA, GA 30067
CONTRACT NUMBER:
RONALD E FORSYTHE
TITLE:
ICE PAVEMENT DETECTION SYSTEM
TOPIC# 201 OFFICE: CRREL/COE

THE PROPOSED EFFORT WILL INVESTIGATE, THEORETICALLY AND EXPERIMENTALLY, THE SENSING OF ICE ON PAVEMENT USING MILLIMETER WAVE REMOTE SENSING TECHNIQUES. SURFACE ROUGHNESS, ANGLE-OF-INCIDENCE, RANGE OF DETECTION, MINIMUM ICE THICKNESS AS WELL AS PREDICTION ALGORITHMS WILL BE INVESTIGATED. CONTAMINANTS AND OTHER VARIABLES WILL BE CONSIDERED.

MISSION RESEARCH CORP SDIO
1720 RANDOLPH RD - SE
ALBUQUERQUE, NM 87106
CONTRACT NUMBER:
DR ALAN H PAXTON
TITLE:
NOVEL RESONATOR FOR FREE-ELECTRON LASER: SIMULATION AND EXPERIMENT
TOPIC# 1 OFFICE:

FREE ELECTRON LASERS (FELs) OPERATED TO DATE HAVE MADE USE OF STABLE

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CAVITIES WITH DIELECTRIC COATED MIRRORS. BECAUSE EITHER A PARTIALLY TRANSMISSIVE ELEMENT OR A DIFFRACTION GRATING OUTCOUPLER IS REQUIRED, THE LIGHT ABSORBED CAUSES DISTORATION OF THE OPTICAL ELEMENT AND DEGRADES THE BEAM QUALITY OF THE LASER OUTPUT. UNDER A PREVIOUS RESEARCH PHASE, THE FEASIBILITY OF USING A COMPACT BEAM UNSTABLE RESONATOR WITH 90 DEGREE FIELD ROTATION WAS EXPLORED BUT SOME DIFFICULTIES WERE FOUND AND A NEW APPROACH IS REQUIRED. IN THE CURRENT RESEARCH, A RELIABLE PHYSICAL OPTICS CODE IS BEING DEVELOPED FOR THE SIMULATION OF FELs INCLUDING THE DETAILED PROPERTIES OF THE OPTICAL RESONATORS. IN ADDITION, THE SUITABILITY FOR FELs OF A NOVEL CLASS OF OPTICAL RESONATORS IS BEING EXAMINED THAT IS STABLE IN ONE TRANSVERSE DIMENSION AND UNSTABLE IN THE OTHER (COMPACT BEAM STABLE-UNSTABLE RESONATOR). THE OUTPUT BEAM HAS A FILLED-IN RECTANGULAR SHAPE THAT IS APPROPRIATE FOR A LASER WITH LOW ROUND-TRIP GAIN. THE PROPOSED CONCEPT, WHEN SUCCESSFULLY DEMONSTRATED, IS EXPECTED TO ALLEVIATE THE PROBLEM OF THERMAL LOADING OF OPTICAL ELEMENTS, OF POWER EXTRACTION FROM A LASER WITH LOW GAIN, AND OF APETURE LOSSES ON THE END OF THE WIGGLER MAGNET ASEMBLY WHICH WOULD BE A PROBLEM FOR THER UNSTABLE RESONATORS.

MISSION RESEARCH CORP AF
3505 CADILLAC AVE - BLDG H
COSTA MESA, CA 92626
CONTRACT NUMBER: F33615-87-C-3247
DR STEVEN F STONE
TITLE:
MODELING TECHNIQUES FOR COMPOSITES SUBJECTED TO RAPID THERMAL LOADING
TOPIC# 132 OFFICE: AFWAL/FI

RESIN, METAL AND CERAMIC MATRIX COMPOSITES SHOULD BE USED WITH EXTREME CARE IN APPLICATIONS WHERE RAPID THERMAL HEATING OCCURS. EVEN LOW FLUENCE (<50J/cm2) HEATING WILL GENERATE STRESSES WHICH CAN BOTH CREATE FLAWS AND CAUSE SMALL INHERENT FLAWS TO PROPAGATE AND REDUCE STRUCTURAL INTEGRITY AND SERVICE LIFE. A DESIGN/ANALYSIS CODE CAPABLE OF SOLVING THE MOST GENERAL PROBLEM OF A VISCOELASTIC COM-POSITE WITH INHERENT FLAWS SUBJECT TO INDEPTH PERIODIC HEATING MUST THEREFORE BE DEVELOPEPD. THIS REQUIRES AT LEAST 2-D NONLINEAR COUPLED DYNAMIC THERMOELASTIC SOLUTIONS. IN PHASE I, MRC DEVELOPED THEORETICAL SOLUTIONS FOR FLOOD LOADING (1-D) SCENARIOS AND IMPLE-

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MENTED UNIQUE ALGEBRAIC MANIPULATION AND LAPLACE TIME TRANSFORM NUMERICAL ALGORITHMS TO ALLOW DIRECT SOLUTION OF THE MATHEMATICALLY INTRACTABLE PROBLEMS. IN THE PHASE II EFFORT, THE SOLUTIONS WILL BE EXTENDED TO ADDRESS SPOT LOADING, COMPLETE NUMERICAL ALGORITHMS WILL BE IMPLEMENTED, UNIQUE INSITU-INSTRUMENTED TEST SAMPLES WILL BE FABRICATED AND CORRELATING PULSED THERMAL PHENOMENOLOGY EXPERIMENTS PERFORMED. A GENERAL PURPOSE MODULAR PC-BASED CODE SUITABLE FOR BOTH DOD/INDUSTRY USE WILL RESULT. IN PHASE III, MRC WILL DEVELOP FLAW TOLERANT DESIGNS AND EXTEND THE CODE TO ADDRESS MECHANICAL DYNAMIC LOADING.

MODULAR SOFTWARE SYSTEMS INC NAVY
33 GRAND CANYON DR
LOS ALAMOS, NM 87544
CONTRACT NUMBER:
GARY P CORT
TITLE:
A CONFIGURABLE AUTOMATED LIBRARIAN FOR COMPUTER SOFTWARE SOURCE CODE
TOPIC# 98 OFFICE: NSWC/SSPO

COORDINATION OF THE SHARING OF SOURCE CODE IN MEDIUM- TO LARGE-SCALE SOFTWARE DEVELOPMENT PROJECTS POSES A DIFFICULT PROBLEM IN THE ABSENCE OF A SOURCE CODE LIBRARIAN SYSTEM. UNFORTUNATELY, SYSTEMS OF THIS TYPE, WHILE POWERFUL AND FLEXIBLE, GENERALLY REQUIRE A LEVEL OF EXPERTISE AND COMMITMENT NOT COMMONLY FOUND IN THE APPLICATIONS CODE DEVELOPER. IN ORDER TO REMEDY THIS SITUATION, MODULAR SOFTWARE SYSTEMS PROPOSES TO DESIGN AND IMPLEMENT A HIGHLY FUNCTIONAL AND PORTABLE SOFTWARE LIBRARIAN SYSTEM BASED UPON COMMERCIALLY-AVAILABLE SOFTWARE COMPONENTS. THE PROPOSED PROGRAM SEEKS TO DEVELOP A LIBRARIAN SYSTEM CHARACTERIZED BY A HIGH LEVEL, INTUITIVE USER INTERFACE AND POWERFUL, DATA-STRUCTURE-DRIVEN COMMANDS FOR CONFIGURING SOFTWARE DEVELOPMENT PROJECTS. BASED UPON A REQUIREMENTS DOCUMENT (GENERATED BY THE PHASE I EFFORT) WHICH SOLIDLY ESTABLISHES THE FEASIBILITY OF THE PROJECT, THE PROPOSED PHASE II PROGRAM SHOULD RESULT IN THE DEVELOPMENT OF A POWERFUL, FLEXIBLE, CONFIGURABLE AUTOMATED SOFTWARE LIBRARIAN SYSTEM WHICH IS COST-EFFECTIVE TO OPERATE AND MAINTAIN, WHICH IMPOSES MINIMAL OVERHEADS UPON PROJECT PARTICIPANTS AND WHICH IS HIGHLY PORTABLE AMONG COMPUTER HARDWARE AND OPERATING SYSTEM COMBINATIONS. AS THE FIRST AND ONLY SUCH ENVIRON-

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MENT TO BE MADE GENERALLY AVAILABLE, THIS SYSTEM HAS THE POTENTIAL TO IMPACT SIGNIFICANTLY THE PRODUCTIVITY OF VIRTUALLY ANY SOFTWARE DEVELOPMENT PROJECT, AS WELL AS THE OVERALL QUALITY OF THE RESULTING SOFTWARE.

MODUSPEC CO ARMY
PO BOX 63 - 534 BOSTON POST RD
WAYLAND, MA 01778
CONTRACT NUMBER:
JACK M GOLDSTEIN
TITLE:
TOXIC GAS DETECTOR
TOPIC# 180 OFFICE: TECOM/AVDTA

A TOXIC GAS DETECTOR IS DESCRIBED THAT DEPENDS UPON OPTICAL TECHNIQUES FOR ALL GASES MONITORED. SPECTROSCOPIC PROPERTIES OF THE GASES IN THE INFRARED REGION ARE USED TO SPECIFY EACH OF SIX GASES TO BE DETECTED, AND THESE GASES ARE MEASURED IN A SINGLE *MULTIREFLECTIVE MEASUREMENT PHOTOMETER*. GASES TO BE MEASURED ARE CO, SO2, N2O, NO2, HC's AND CH1, AND THESE GASES ARE DISTINGUISHED BY SPECTRAL CORRELATION TECHNIQUES, INVOLVING THE INTERACTIVE USE OF A SELF-CONTAINED MICROPROCESSOR. THE UNIT IS INTENDED TO BE SMALL IN SIZE AND PORTABLE. GASES WOULD BE SAMPLED BY A PUMP, AND THE UNIT IS INTENDED TO BE USED IN AIRCRAFT COCKPITS. THE UNIT WOULD STORE IN INTERNAL MEMORY MEASUREMENT INFORMATION OBTAINED IN FLIGHT. THE UNIT WOULD BE INTERROGATED ON THE GROUND BY A COMPUTER OR OTHER READ-OUT DEVICE. THREE PROTOTYPE UNITS ARE INTENDED TO BE CONSTRUCTED FOR USE BY THE DOD UNDER THIS PROPOSED PHASE II EFFORT, WHICH IS BASED ON A PHASE I EFFORT RECENTLY COMPLETED.

MacAULAY-BROWN INC ARMY
3915 GERMANY LN
DAYTON, OH 45431
CONTRACT NUMBER:
SHERMAN O ROSS
TITLE:
ARTIFICIAL INTELLIGENCE FOR LHX AIRCRAFT SURVIVABILITY EQUIPMENT
TOPIC# 61 OFFICE: CECOM/AMSEL

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FOR PHASE II OF THIS SBIR EFFORT, MacB PROPOSE TO ESTABLISH THE REQUIREMENTS BASELINE, PERFORM THE SYSTEMS ENGINEERING ANALYSIS, AND VERIFY THE EXPERT SYSTEM DESIGN FOR THE INEWS APPLICATION FOR THE LHX HELICOPTER. THIS EFFORT IS COMPOSED OF THREE DISTINCT TASKS: THREAT DOCUMENTATION, MISSION ANALYSIS, AND SYSTEMS ENGINEERING ANALYSIS. THESE TASKS ARE FULLY DESCRIBED.

MacAULAY-BROWN INC ARMY
3989 COLONEL GLENN HWY
FIARBORN, OH 45324
CONTRACT NUMBER:
CHARLES G BROWN
TITLE:
SPECIAL WAVEFORM ECM EFFECTIVENESS ANALYSIS
TOPIC# 62 OFFICE: CECOM/EW

MacAULY-BROWN HAS BEEN FUNDED THROUGH VARIOUS PROGRAMS TO DEVELOP A MONOPULSE TECHNIQUES SIMULATION (MTS), COMPUTER MODEL. THE MTS MODEL IS USED TO EVALUATE ELECTRONIC COUNTERMEASURE (ECM) TECHNIQUES. THIS SBIR PHASE II PROPOSES TO EXPAND THE MTS MODEL TO INCLUDE TWO NEW CAPABILITIES AND TO EVALUATE SPECIAL WAVEFORM ECM AGAINST THEM. ECM PERFORMANCE IS PLOTTED IN DEGREES OF AZIMUTH VERSUS DEGREE OF ELEVATION TRACKING ERROR. THE FIRST AND MOST SIGNIFICANT EXPANSION TO THE MTS MODEL IS THE CREATION OF A COHERENT RADAR MODEL. THE COHERENT RADAR MODEL WILL BE REPRESENTATIVE OF AN EXISTING COHERENT TARGET TRACK RADAR THREAT. TO ENSURE ACCURATE REPRESENTATION THE CONTRACTOR HAS BASED HIS PROPOSED DESIGN ON THE INTELLIGENCE DATA INPUT PACKAGE (IDIP) FOR THE THREAT RADAR. THE COHERENT RADAR MODEL WILL BE IMPLEMENTED AS A SINGLE CHANNEL RECEIVER WITH A DOPPLER TRACKING LOOP. THE MAJORITY OF WORK REQUIRED TO CREATE THE COHERENT RADAR MODEL ARE THE RF/INTERMEDIATE FREQUENCY (IF) COMPONENTS, A TARGET MOTION REPRESENTATION FOR DOPPLER INFORMATION EXTRACTION, A VELOCITY GATE PULL-OFF (VGPO) ECM TECHNIQUE, AND A DOPPLER REACQUISITION ALGORITHM. OTHER NEEDED CHARACTERISTICS ARE THE ANTENNA, ANTENNA SERVO MECHANISM, MISSILE STEERING, MISSILE DYNAMICS, AND ENGAGEMENT GEOMETRY. THE SECOND PORTION OF THE PROPOSAL IS TO IMPLEMENT A TYPE II ANTENNA SERVO MECHANISM IN A DIFFERENT MODEL WITHIN MTS CALLED SYSTEM H, ANOTHER EXISTING RADAR THREAT REPRESENTATION. DURING PHASE I TARGET AIRCRAFT MANEUVERS WERE INCORPORATED INTO SYSTEM H. THE SYSTEM H MODEL WAS THEN USED TO STUDY SPECIAL

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WAVEFORM ECM TECHNIQUES IN CONJUNCTION WITH CONSTANT ANGULAR RATE MANEUVERS. THE ASSUMED THREAT ANTENNA SERVO IMPLEMENTATION WAS A NARROW BAND TYPE I. IN PHASE II THE CONTRACTOR HAS PROPOSED REPEATING THE SPECIAL WAVEFORM ECM STUDY WITH THE TYPE II SERVO DESIGN. SYNERGISTIC EFFECTS BETWEEN ECM AND AIRCRAFT MANEUVERS VERSUS THE SYSTEM H MODEL WILL BE STUDIED AND COMPARED WITH PHASE I RESULTS.

NEVADA ENGINEERING & TECHNOLOGY CORP NAVY
592 DRYAD RD
SANTA MONICA, CA 90402
CONTRACT NUMBER:
RUSSELL G SHERMAN
TITLE:
BEHAVIOR OF METAL MATRIX COMPOSITES AT CRYOGENIC TEMPERATURES
TOPIC# 112 OFFICE: NSWC/SSPO

THIS EFFORT WILL DETERMINE THE CRYOGENIC TEMPERATURES AT WHICH P100/6061 IN THE T6 AND THE ANNEALED CONDITION SUFFER A DECREASE IN MODULUS OF ELASTICITY. IT WILL ALSO PROVIDE DATA ON THIS MATERIAL AND B(4)C/6061T6 AFTER 2000 THERMAL CYCLES BETWEEN -250 DEG F AND 250 DEG F. ALSO TO BE EVALUATED UNDER THESE CONDITIONS WILL BE AN ADHESIVELY BONDED COUPLE SIMULATING THE LOCKHEED TRUSS TUBES AND END FITTINGS. DAMAGE TOLERANCE AS AFFECTED BY CRYOGENIC TEMPERATURES WILL BE DETERMINED ON B(4)C/6061T6, SiC/6061T6 AND B(4)C/Mg BY THE USE OF BOTH A MILD STRESS RISER (DRILLED HOLE) AND A SEVERE ONE (SHARP EDGE CRACK). ADDITIONAL WORK WILL BE PERFORMED FURTHER DEFINING CRYOGENIC LAP JOINT PROBLEMS IN THE BONDING OF MMC WITH DIFFERENCES IN CTE AND INVESTIGATING THE PROBLEM OF LOW BOND STRENGTH OF FACE SHEET TO MATRIX OF P100/6061 AT 250 DEG F. BECAUSE THE TRUSS TUBES FOR LOCKHEED WILL BE FABRICATED BY PULTRUSION AND DIFFUSION BONDING BOTH OF THESE MATERIAL WILL BE INVESTIGATED FOR THIS PROBLEM.

NICHOLS RESEARCH CORP SDIO
4040 S MEMORIAL PKWY
HUNTSVILLE, AL 35802
CONTRACT NUMBER:
KENNETH H DENT
TITLE:
KINETIC ENERGY PROJECTILE LETHALITY ENHANCEMENT
TOPIC# 2 OFFICE:

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THE POTENTIAL EXISTS TO USE HIGHLY REACTIVE CHEMICAL PELLETS CONTAINING CHORINE PENTA-FLUORIDE TO ENHANCE THE LETHALITY OF EXTREMELY LOW MASS KINETIC ENERGY PROJECTILES AGAINST BALLISTIC MISSILES DURING THEIR BOOSTED PHASE OF FLIGHT. IN A PREVIOUS RESEARCH PHASE, THE BASIC FEASIBILITY OF THIS CONCEPT WAS VERIFIED AND THE PRELIMINARY DESIGN OF SUITABLE PROJECTILES EXPLORED. UNDER THE CURRENT RESEARCH EFFORT, MORE REFINED PROJECTILE DESIGNS FOR VARIOUS TYPES OF BOOSTERS ARE BEING DEVELOPED. ADDITIONALLY, SUCH PROJECTILES ARE BEING MANUFACTURED AND TESTED IN A SERIES OF STATIC, LOW VELOCITY AND HYPERVOLICITY EXPERIMENTS AGAINST REALISTIC TARGETS WHICH ARE SERVING TO DEMONSTRATE AND QUANTIFY THE CONCEPT UNDER A VARIETY OF CONDITIONS. THE INCREASE IN PROJECTILE LETHALITY ASSOCIATED WITH THIS CONCEPT, WHEN SUCCESSFULLY DEMONSTRATED, WOULD IMPROVE SIGNIFICIANTLY THE PROBABILITY OF BOOSTER KILL FOR KINETIC ENERGY WEAPON SYSTEMS.

NICHOLS RESEARCH CORP AF
4040 S MEMORIAL PKWY
HUNTSVILLE, AL 35802
CONTRACT NUMBER:
DR WILLIAM H SCHOENDORF
TITLE:
ANTI-SIMULATION FOR PENETRATION AIDS
TOPIC# 270 OFFICE: BMO/MYSC

THE CREDIBILITY OF PENAIDS IS A KEY ELEMENT IN OVERALL OFFENSE SYSTEM EFFECTIVENESS. ANTISIMULATION TACTICS CAN PROVIDE THE OFFENSE DESIGNER WITH ADDITIONAL DEGREES OF FREEDOM NOT AVAILABLE WITH THE SIMULATION TACTIC. THIS PROPOSED PHASE II RESEARCH WILL PROVIDE A THOROUGH EVALUATION OF OPTICAL ANTISIMULATION TACTICS AND ASSESS THE AVAILABILITY OF MATERIAL TECHNOLOGIES NECESSARY TO IMPLEMENT THESE TACTICS. THIS RESEARCH WILL BEGIN WITH CONCEPTS DEVELOPED DURING THE PHASE I EFFORT - NAMELY RANDOM VARIATIONS OF INFRARED EMISSIVITY (ETA) AND SOLAR ABSORPTIVITY (ALPHA) OVER WAVEBANDS AND TARGETS. THESE CONCEPTS WILL BE EXTENDED IN PHASE II TO INCLUDE OPTIMIZATION OF THE PARAMETERS OF THE DISTRIBUTIONS FOR THE EXOATMOSPHERE, VERIFICATION OF ENDOATMOSPHERIC PERFORMANCE AND A FURTHER CONSIDERATION OF SHROUDED REENTRY VEHICLES. THE CONSEQUENCES OF A PRIORI INFORMATION DENIAL WILL BE ASSESSED. TO PROPERLY EVALUATE THE BENEFITS OF THE PROPOSED NEW ANTISIMULATION TACTICS, AN EVALUATION OF DEFENSE

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RESPONSES WILL BE UNDERTAKEN - INCLUDING THE FUSION OF RADAR AND OPTICAL SENSORS AND THE DEVELOPMENT OF ADAPTIVE ALGORITHMS SUITABLE FOR DISCRIMINATION WITH LIMITED OR NO PRIOR KNOWLEDGE. SPECIFIC ASPECTS OF THE RV AND PENAID PROPERTIES THAT ARE IMPORTANT TO DENY TO THE DEFENSE WILL BE IDENTIFIED ALONG WITH ADDITIONAL MEANS OF INFORMATION DENIAL AVAILABLE TO THE ANTISIMULATION OFFENSE DESIGNER.

NIELSEN ENGINEERING & RESEARCH INC AF
510 CLYDE AVE
MOUNTAIN VIEW, CA 94043
CONTRACT NUMBER: FQ8671-8601196
DAVID NIXON
TITLE:
SUPERMANEUVER AERODYNAMICS STUDY
TOPIC# 1 OFFICE: AFOSR/XOT

THE PROPOSED WORK CONCERNS A NOVEL APPROACH TO THE STUDY OF AERODYNAMICS DURING TRANSIENT MANEUVERS. PREVIOUS WORK HAS SHOWN THAT AUGMENTED AERODYNAMIC CHARACTERISTICS, SUCH AS VERY HIGH LIFT COEIFFICIENT, MAY BE OBTAINED DUE TO THE TRANSIENT NATURE OF SOME MANEUVERS. THE FLUID MECHANICS THAT AFFECT THESE DESIRABLE CHARACTERISTICS CAN BE COMPLEX AND DIFFICULT TO STUDY, DUE TO THEIR TRANSIENT NATURE, AND DUE TO THE COMBINATIONS OF PITCH, ROLL AND DECELERATION THAT MAY OCCUR. THIS PROPOSAL CONCERNS THE DEVELOPMENT OF A COMPUTATIONAL ANALYSIS TECHNIQUE FOR EXAMINING IMPORTANT SUB-ELEMENTS OF THE FLOW-FIELDS THAT ARISE DURING SUCH MANEUVERS. THE TECHNIQUE WILL DETERMINE THE CRITICAL FLUID MECHANISMS WHICH CONTROL THE FLOW IN THE SUB-ELEMENT. THE ULTIMATE OBJECTIVE IS TO EXAMINE METHODS OF EXISTING CONTROL OVER THE SUB-ELEMENT FLOWS, IN AN EFFORT TO ACHIEVE MORE DESIRABLE AERODYNAMIC CHARACTERISTICS.

ODETICS INC ARMY
1515 S MANCHESTER AVE
ANAHEIM, CA 92802
CONTRACT NUMBER:
ALAN ROHRABACHER
TITLE:
ROBOTIC RESUPPLY CONTROLLER
TOPIC# 1 OFFICE: ARDC/SMCAR

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ROBOTIC RESUPPLY OF 155mm SP HOWITZERS WILL BE A MAJOR DEVELOPMENT FOR THE US ARMY TO REALIZE FURTHER FORCE MULTIPLICATION AND INCREASED SURVIVABILITY IN FIELD ARTILLERY. A KEY ENABLING TECHNOLOGY WILL BE A REAL TIME, EMBEDDED COMPUTER CONTROLLER WHICH CAN AUTOMATICALLY OPERATE AND CONTROL THE RESUPPLY MISSION MODULE ON A ROBOTIC RESUPPLY VEHICLE TO EFFECT ITS INTERFACE TO THE HOWITZER AS WELL AS THE AMMUNITION RESUPPLY TASK ITSELF. THIS PROJECT WILL DESIGN, BUILD AND DELIVER A COMPACT, REAL TIME, MULTI-TASKING COMPUTER CONTROLLER FOR A ROBOTIC RESUPPLY VEHICLE.

ODETICS INC ARMY
1515 S MANCHESTER AVE
ANAHEIM, CA 92802
CONTRACT NUMBER:
DR TIMOTHY R LARSON
TITLE:
LASER NAVIGATION FOR TACTICAL ROBOTIC VEHICLES
TOPIC# 113 OFFICE: TACOM/AMSTA

RELIABLE AND ASSURED, SELF-CONTAINED MEANS OF POSITION DETERMINATION IS NEEDED FOR TACTICAL ROBOTIC VEHICLES. DEAD RECKONING IS ESSENTIAL FOR LONG TERM NAVIGATION BUT DRIFT ERROR ACCUMULATION CAN CAUSE LOSS OF THE CRITICAL POSITION REFERENCE. THIS PROJECT WILL DELIVER A VEHICULAR TESTBED WITH A COMPLETE AND SELF-CONTAINED POSITION DETERMINATION SYSTEM TO ENABLE AUTOMATIC NAVIGATION CAPABILITIES THROUGH ON-BOARD DMA TERRAIN DATA BASE CORRELATION WITH RANGING INPUTS TO SURROUNDING TERRAIN SURFACES FROM AN EYE-SAFE LASER RANGEFINDER ON AN AUTOMATICALLY CONTROLLED POINTING PLATFORM.

OPCOA INC AF
1202 N BROADWAY
SANTA ANA, CA 92701
CONTRACT NUMBER: F33615-87-C-2842
DR WILLIMA H QUICK
TITLE:
TURBINE ENGINE TEST INSTRUMENTATION USING FIBER-OPTIC TEMPERATURE SENSOR
TOPIC# 179 OFFICE: AFWAL/PO

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ADVANCED IN FIBER-OPTIC AND ELECTRONIC PROCESSING TECHNOLOGIES HAVE PERMITTED THE DEVELOPMENT OF A FAMILY OF FIBER-OPTIC BASED SENSORS (TEMPERATURE, PRESSURE, DISPLACEMENT, ETC.) COMPATIBLE WITH MICRO-PROCESSOR SYSTEMS. ONE SUCH SENSOR, A TEMPERATURE SENSOR, CONSISTS OF A VARIABLE GAP FABRY-PEROT CAVITY WHICH MODULATES AN INCIDENT BROADBAND SPECTRUM ACCORDING TO GAP DIMENSION. THE TECHNICAL ACCOMPLISHMENTS OF PHASE I OF THIS PROGRAM HAVE DEMONSTRATED THE FEASIBILITY OF FABRICATING SUCH A SENSOR. THE GOAL OF PHASE II IS TO FABRICATE, FIELD TEST AND DELIVER A "BRASSBOARD" MODEL. THE FOLLOWING ARE SPECIFIC, PHASE II TECHNICAL OBJECTIVES FOR ACCOMPLISHING THIS GOAL: (1) MOUNT THE SENSOR ELEMENT WITHIN A RUGGED STAINLESS STEEL HOUSING. (2) DEVELOP AND FABRICATE A THIN-FILM, MICRO-OPTIC DEMODULATION SUBSYSTEM. (3) PRODUCE SYSTEM CONTROL AND DEMODULATION ELECTRONIC CIRCUIT BOARDS COMPLETE WITH MICRO-OPTIC DEMODULATION FOR AN IBM XT. (4) ANALYZE THE FINISHED BRASSBOARD SYSTEM USING ENVIRONMENTAL SIMULATION.

OPTELECOM INC NAVY
15930 LUANNE DR
GAITHERSBURG, MD 20877
CONTRACT NUMBER:
EDMUND D LUDWIG
TITLE:
LINK ELECTRONICS FOR ROBOTIC SYSTEM ENHANCEMENTS
TOPIC# 122 OFFICE: NSWC/SSPO

IN PHASE I, OPTELECOM DEVELOPED FUNCTIONAL SPECIFICATIONS AND A GENERIC FIBER OPTICS LINK ARCHITECTURE SUITABLE FOR TELEOPERATOR CONTROL OF MOBILE ROBOTIC SYSTEMS. COMPARISONS WERE MADE BETWEEN THE RECOMMENDED LINK CONFIGURATION AND HARDWARE CURRENTLY UNDER DEVELOPMENT AT OPTELECOM FOR OTHER PROGRAMS. PROPOSED PHASE II WORK ENCOMPASSES DETAILED LINK ELECTRONICS DESIGN AND FABRICATION, WITH EMPHASIS ON PROVIDING FOR MAXIMUM FLEXIBILITY IN ADAPTING TO DIVERSE NAVY ROBOTICS APPLICATIONS. THE PROPOSED APPROACH INVOLVES USE OF A TWELVE CHANNEL GRATING MULTIPLEXER AND INTERFACE CIRCUITRY DESIGNED TO ACCEPT NAVY COMMUNICATIONS PROTOCOLS CURRENTLY IN USE. PROPOSED WORK ALSO INCLUDES STUDIES RELATING TO SURVIVAL OF THE FIBER OPTIC LINK IN EXPECTED ENVIRONMENTS, SYSTEM INTEGRATION STUDIES RELATED TO REQUIREMENTS FOR CABLE HANDLING HARDWARE AND FABRICATION AND TEST OF A VERSATILE LABORATORY MODEL CABLE HANDLING

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SYSTEM INTEGRATED WITH RUGGEDIZED ELECTRONICS.

OPTI-METRICS INC AF
2008 HOGBACK RD - STE 6
ANN ARBOR, MI 48105
CONTRACT NUMBER:
WILLIAM O GALLERY
TITLE:
SCRIBE DATA VALIDATION AND ANALYSIS
TOPIC# 73 OFFICE: AFGL/XOP

THE STRATOSPHERIC CRYOGENIC INTERFEROMETER BALLOON EXPERIMENT (SCRIBE) IS A HIGH RESOLUTION INFRARED SPECTROMETER DESIGNED TO MEASURE ATMOSPHERIC EMISSION FROM A STRATOSPHERIC BALLOON PLATFORM. THE DATA ARE USEFUL IN DETERMINING TRACE GAS AMOUNTS AND VALIDATING MODELS OF ATMOSPHERIC RADIANCE. THE OBJECTIVES OF THIS RESEARCH ARE TO PROVIDE FLIGHT PLANNING, SUPPORT AND COORDINATION; REDUCE, CALIBRATE AND VALIDATE THE DATA OBTAINED BY SCRIBE; AND ANALYZE THE DATA FOR TRACE GASES AND TO PERFORM MODEL VALIDATION STUDIES.

OPTRA INC SDIO
83 PINE ST
PEABODY, MA 01960
CONTRACT NUMBER:
GEERT WYNTJES
TITLE:
INTERFEROMETRIC OPTICAL SYNCHRO FOR ALIGNMENT TRANSFER
TOPIC# 3 OFFICE:

SPACE WEAPONS FIRE CONTROL REQUIRES THAT THE FINAL WEAPON AIM POINT BE PREDICTED WITH A PRECISION IN THE TENS OF NANORADIANS RANGE. ONE APPROACH TO ADDRESS THIS ISSUE INVOLVES THE DEVELOPMENT OF A PAIR OF CALIBRATED ANGLE ENCODERS HAVING AN ANGULAR RESOLUTION AND PRECISION OF 100 NANORADIANS OR BETTER. UNDER THE PREVIOUS RESEARCH PHASE, THE THEORETICAL CAPABILITY OF TWO FREQUENCY LASER METROLOGY WAS REDUCED TO PRACTICE TO MEASURE SHAFT ROTATION ANGLE (0.5 MICRORADIAM RESOLUTION AND PRECISION WERE DEMONSTRATED). UNDER THE CURRENT RESEARCH EFFORT, A PAIR OF INDEPENDENT ANGULAR SHAFT POSITION SENSORS ARE BEING BUILT HAVING RESOLUTION AND PRECISION OF 100 NANORADIANS. THESE

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SENSORS ARE BEING USED TO MAINTAIN ANGULAR ALIGNEMENT BETWEEN TWO SHAFTS TO WITHIN 100 NANORADIANS. THE PROPOSED SENSOR, WHEN SUCCESS-FULLY DEMONSTRATED, WOULD OFFER THE FOLLOWING ADVANTAGES: VERY HIGH PRECISION AND RESOLUTION IN A SMALL PACKAGE; HIGH UP-DATE RATE; IMMUNITY TO ELECTRO-MAGNETIC INTERFERENCE THROUGH THE USE OF FIBER OPTICS; AND A DESIGN WITH A BUILT-IN SYNCHRO CAPABILITY. APPLICATIONS FOR THIS PRECISION POINTING AND TRACKING CAPABILITY INCLUDE PRECISION ANGLE ENCODERS FOR DIRECTED ENERGY WEAPONS, AND SPACE-BASED LASER COMMUNICATIONS, ENERGY TRANSFER, AND OBSERVATIONAL ASTRONOMY.

OPTRA INC NAVY
83 PINE ST - WEST PEABODY OFFICE PK
PEABODY, MA 01960
CONTRACT NUMBER:
DR MICHAEL HERCHER
TITLE:
NON-CONTACT LASER MEASUREMENT OF THERMAL EXPANSION
TOPIC# 115 OFFICE: NSCW/SSPO

BASED ON THE TECHNICAL SUCCESS OF THE PHASE I EFFORT, OPTRA PROPOSES A PHASE II PROGRAM WHOSE GOAL IS THE DESIGN, BUILDING, AND DELIVERY TO THE NSWC OF A COMPLETE SYSTEM FOR THE NON-CONTACT AUTOMATED MEASUREMENT OF THE THERMAL EXPANSION OF SAMPLES CONTAINED IN AN EVACUATED CHAMBER. THE PROGRAM INCLUDES THE DEVELOPMENT OF AN ORTHOGONAL SENSOR SET (FOR SURFACE), AND A STUDY OF TECHNIQUES TO ALLOW THE MAPPING OF LOCAL SURFACE STRAINS OVER AN EXTENDED AREA. THE TARGET TECHNICAL SPECIFICATIONS INCLUDE MEASUREMENT SENSITIVITY AND ACCURACY ON THE ORDER OF 1 X 10(-7) PER DEG C, SENSOR STAND-OFF DISTANCE OF 15cm, SPECIMEN TEMPERATURE RANGE OF -200 DEG TO +200 DEG C, AND MEASUREMENT UPDATE RATE OF kHz. THE SYSTEM WILL INCORPORATE A PERSONAL COMPUTER WHICH WILL BE USED FOR DATA LOGGING, DISPLAY, AND INTERPRETATION.

OPTRON SYSTEMS INC SDIO
3 PRESTON CT
BEDFORD, MA 01730
CONTRACT NUMBER:
CARDINAL WARDE
TITLE:
HYBRID SPATIAL LIGHT MODULATOR FOR JOINT PROCESSING OF RADAR AND OPTICAL IMAGES
TOPIC# 3 OFFICE:

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AN ADVANCED SIGNAL PROCESSOR IS NEEDED THAT EMPLOYS SEVERAL SPECTRAL INPUT IMAGING CHANNELS OPERATING AT DIFFERENT WAVELENGTHS AND INTELLIGENTLY PROCESSES THIS MULTISPECTRAL INFORMATION. A HYBRID OPTICAL SIGNAL PROCESSING SYSTEM CALLED THE ADAPTIVE MULTISPECTRAL IMAGE CORRELATOR (AMSIC) HAS BEEN DESIGNED TO ADDRESS THIS PROBLEM. THE AMSIC IS DESIGNED TO OPERATE IN LOW-PHOTON AND LOW-CONTRAST ENVIRONMENTS, WITH LONG-RANGE UNCOOPERATIVE TARGETS WITHIN UNCOOPERATIVE ENVIRONMENTS, AND WHERE TARGET DECISIONS NEED TO BE MADE URGENTLY. THE AMSIC EMPLOYS AN ELECTRONIC KNOWLEDGE-BASE IN WHICH APRIORI OBJECT AND/OR SCENE INFORMATION ARE STORED, AND IT USES ASSOCIATIVE MEMORY TECHNIQUES FOR APRIORI KNOWLEDGE RECALL SO AS TO PERFORM IMAGE PROCESSING AND INFERENCING. UNDER THE PREVIOUS RESEARCH PHASE, AN OPTICAL SIGNAL PROCESSING ARCHITECTURE AND ASSOCIATED CONTROL ALGORITHMS WERE CREATED THAT MIGHT PROVE USEFUL FOR FEATURE EXTRACTION, IMAGE IDENTIFICATION, CLUTTER REJECTION AND/OR TARGET DISCRIMINATION. THE FEASIBILITY OF A FOUR-PORT HYBRID OPTICAL DEVICE CALLED AN ELECTROSTATIC PRECIPITATING LIGHT MODULATOR WAS DEMONSTRATED. SUCH A SPATIAL LIGHT MODULATION DEVICE WILL BE REQUIRED TO IMPLEMENT ADVANCED OPTICAL PROCESSOR DESIGNS. IN THE CURRENT RESEARCH EFFORT, A FUNCTIONAL BREADBOARD OF THE AMSIC IS BEING DEVELOPED, FABRICATED AND DEMONSTRATED AND A FULL UNDERSTANDING OF THE PERFORMANCE LIMITATIONS OF THE ENTIRE SYSTEM DEVELOPED THROUGH COMPUTER SIMULATIONS AND THE PERFORMANCE OF THE BREADBOARD AMSIC.

OPTRON SYSTEMS INC SDIO
3 PRESTON CT
BEDFORD, MA 01730
CONTRACT NUMBER:
JEFFREY BOUNDS
TITLE:
HIGH RESOLUTION HIGH SPEED BISTABLE OPTICAL DEVICE FOR OPTICAL COMPUTING APPLICATIONS
TOPIC# 9 OFFICE:

LARGE, TWO-DIMENSIONAL ARRAYS OF BISTABLE DEVICES WITH MILLIONS OF PIXELS THAT EXHIBIT INTRINSIC BISTABLE OR THRESHOLD-TYPE SWITCHING CHARACTERISTICS ARE URGENTLY NEEDED FOR THE IMPLEMENTATION AND EVALUATION OF SEVERAL ADVANCED ALGORITHMS AND SYSTEMS IN OPTICAL SIGNAL PROCESSING/COMPUTING. MEGA-PIXEL, BISTABLE OPTICAL ARRAY TECHNOLOGY IS WELL SUITED TO THESE APPLICATIONS BY NATURE OF ITS

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VARIED UTILITY AND HIGH PERFORMANCE CHARACTERISTICS. THE FEASIBILITY OF THIS APPROACH WAS CONCLUSIVELY DEMONSTRATED DURING A PREVIOUS RESEARCH PHASE. A SERIES OF SMALL-SCALE PROTOTYPES OF BISTABLE OPTICAL DEVICES WERE FABRICATED, THEIR PERFORMANCE EVALUATED AND THE FABRICATION PROCEDURE OPTIMIZED. IN THE CURRENT RESEARCH EFFORT, THE PERFORMANCE AND MANUFACTURABILITY OF THESE VERSATILE OPTICAL COMPUTING DEVICES IS BEING EXTENDED AND A SMALL-SCALE NEURAL NETWORK PROCESSOR DEMONSTRATED USING THESE DEVICES. WHEN SUCCESSFULLY DEMONSTRATED, APPLICATIONS WOULD INCLUDE OPTICAL NEURAL-NET-BASED MACHINES, OPTICAL INFERENCE ENGINES, AND REPROGRAMMABLE OPTICAL INTERCONNECTION DEVICES TECHNOLOGY. APPLICATIONS SUCH AS MULTISPECTRAL IMAGE PROCESSING, OPTICAL CLUTTER REJECTION, TARGET DISCRIMINATION AND IDENTIFICATION, PATTERN RECOGNITION, INDUSTRIAL INSPECTION, AND MACHINE VISION WOULD BENEFIT FROM THIS TECHNOLOGY.

ORD INC ARMY
PO BOX 50
NAHANT, MA 01908
CONTRACT NUMBER:
THOMAS R GLASS
TITLE:
FIBER OPTIC MICROSENSOR FOR RECEPTOR-BASED ASSAYS
TOPIC# 38 OFFICE: CRDEC/AMSMC

A UNIQUE OPPORTUNITY NOW EXISTS TO PROVIDE AN INEXPENSIVE, RAPID, FIELDABLE, MINIATURE RECEPTOR-BASED BIOSENSOR SYSTEM WHOSE SENSITIVITY IS LIMITED ONLY BY BIOCHEMICAL FACTORS, E.G. THE RECEPTOR'S SPECIFIC BINDING CAPABILITY. A COMBINATION OF FOUR ACCOMPLISHMENTS MAKES SUCCESS VERY LIKELY. FIRST, CRDEC DEMONSTRATED THE FEASIBILITY OF A RECEPTOR-BASED "FIBER-OPTIC EVANESCENT-WAVE" (FE) BIOSENSOR FOR TOXIN DETECTION. SECOND, THE SENSITIVITY ACHIEVED IN PHASE I BY ORD'S FE OPTICAL TRANSDUCER ESTABLISHED THAT ASSAY SENSITIVITY WILL BE LIMITED ONLY BY BIOCHEMICAL FACTORS. THIRD, THE SUCCESSFUL DEVELOPMENT OF A FIRST GENERATION POCKET SIZE FE INSTRUMENT (INTERNALLY FUNDED BY ORD), DEMONSTRATED THE FEASIBILITY OF SYSTEM MINIATURIZATION. FOURTH, ORD RECENTLY DEVELOPED NOVEL AND PROPRIETARY COMPONENTS AND MATERIALS WHICH ENABLES THE DEVELOPMENT OF AN INEXPENSIVE AND RUGGED FE FIELD INSTRUMENT. WE THEREFORE PROPOSE THAT ORD DEVELOP A PROTOTYPE RAPID, SENSITIVE, SECOND GENERATION POCKET SIZE FIELD INSTRUMENT AND BE RESPONSIBLE FOR SYSTEM INTEGRATION. THIS PROTOTYPE WILL BE

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DELIVERED TO CRDEC. ALLIED-SIGNAL INCORPORATED WILL DEVELOP AND EVALUATE RECEPTOR-BASED ASSAYS FOR TOXIN DETECTION USING ORD'S OPTICAL FIBERS AND FE OPTICAL TRANSDUCER. RECEPTOR COATED FIBERS WILL ALSO BE DELIVERED. WE EXPECTED THE PROPOSED PROGRAM TO LEAD TO A PRACTICAL, MINIATURE, RECEPTOR-BASED BIOSENSOR SYSTEM.

PACER SYSTEMS INC AF
300 WELSH RD - 4 HORSHAM BUSINESS CTR
HORSHAM, PA 19044
CONTRACT NUMBER:
JOAN M RYDER
TITLE:
MODERN TRAINING MODEL CONCEPTS
TOPIC# 284 OFFICE: AMD/RDO

THE OVERALL OBJECTIVE OF THIS PHASE II EFFORT IS TO DEVELOP AND VALIDATE AN INTEGRATED TASK ANALYSIS METHODOLOGY INCORPORATING COGNITIVE SCIENCE CONCEPTS WITHIN THE EXISTING ISD FRAMEWORK. ADVANCES IN COGNITIVE SCIENCE, REVIEWED IN PHASE I, PROVIDE NEW WAYS OF CHARACTERIZING LEARNING AND SKILL DEVELOPMENT THAT ARE MORE APPROPRIATE FOR THE COMPLEX TASKS REQUIRING TRAINING TODAY THAN THE BEHAVIORAL CONSTRUCTS ON WHICH EXISTING ISD PROCEDURES WERE BASED. THESE ADVANCES DEAL WITH HOW INFORMATION IS PROCESSED AND ORGANIZED IN MEMORY, HOW PROCESSING RESOURCES ARE ALLOCATED, AND HOW MENTAL MODELS ARE USED TO STRUCTURE PROBLEM-SOLVING. A HANDBOOK WILL BE DEVELOPED PROVIDING METHODS FOR CONDUCTING A COGNITIVE-BASED TASK ANALYSIS INCLUDING PROCEDURES FOR KNOWLEDGE BASE ANALYSIS, DETERMINATION OF MENTAL MODELS USED BY NOVICES AND EXPERTS, AND TASK DECOMPOSITION AND COMPONENT SKILL IDENTIFICATION. THE AREA OF EW TACTICS WILL BE ANALYZED USING THE DEVELOPED METHODOLOGY AS A MEANS TO TEST AND REFINE IT. A MICROCOMPUTER-BASED TRAINING SYSTEM WILL BE DEVELOPED TO TRAIN ONE ASPECT OF EW TACTICS, IDENTIFIED IN THE TASK ANALYSIS, AND SUBJECTED TO A FIELD EVALUATION TO DETERMINE ITS VALUE IN IMPROVING PERFORMANCE IN THE SELECTED SKILL.

PACIFIC APPLIED RESEARCH SDIO
6 CRESTWIND DR
RANCHO PALOS VERD, CA 90274
CONTRACT NUMBER:
WALTER R WARREN JR
TITLE:
SHORT WAVELENGTH CHEMICAL LASER FLUID DYNAMICS
TOPIC# 1 OFFICE:

SUBMITTED BY DEPT

FLUID DYNAMICS HAS PLAYED CRITICAL ROLES IN THE DEMONSTRATION AND GROWTH OF ALL HIGH ENERGY LASER CONCEPTS AND WILL HAVE SIMILAR INFLUENCES ON THE DEVELOPMENT OF SHORT WAVELENGTH CHEMICAL LASERS (SWCLs). RESEARCH WORK IN A PREVIOUS PHASE HAS IDENTIFIED TWO E-V TRANSFER, SWCL MECHANISMS EACH OF WHICH IS BASED ON THE COMBINATION OF FLUID DYNAMIC AND CHEMICAL APPROACHES AND HAS A GOOD PROBABILITY OF ACHIEVING AN EFFICIENT, HIGH POWER STATUS. THE SPONTANEOUS LIFETIME OF EACH IS CONSIDERABLY DIFFERENT (ONE SHORT, AND ONE INTERMEDIATE) AND THIS LEADS TO DIFFERENT LABORATORY EXPERIMENTAL APPROACHES FOR THE DEMONSTRATION AND SUBSEQUENT STUDY OF BOTH CONCEPTS THAT CURRENTLY ARE BEING UNDERTAKEN. IF SUCCESSFUL IN BOTH DEMONSTRATING SWCLs AND IDENTIFYING CONFIGURATIONS SCALABLE TO HIGH POWER LEVELS, IT WILL THEN BE POSSIBLE TO PLAN GROWTH EXPERIMENTS THAT ADDRESS SUCH ISSUES AS THE COUPLING OF THE LASER MEDIUM WITH A PRACTICAL OPTICAL SYSTEM AND THE DEMONSTRATION OF THE BEAM QUALITY LEVEL NEEDED FOR STRATEGIC DEFENSE APPLICATIONS.

PDA ENGINEERING AF
2975 RED HILL AVE
COSTA MESA, CA 92626
CONTRACT NUMBER: F33615-88-C-5412
WILLIAM H PFEIFER
TITLE:
AN ASSESSMENT OF THE USE OF COMPUTED TOMOGRAPHY AS AN IMPROVED QUANTITATIVE NDE TECHNIQUE FOR COMPOSITE MATERIALS
TOPIC# 159 OFFICE: AFWAL/ML

THE PHASE I PROGRAM DEMONSTRATED THE ABILITY OF COMPUTER TOMOGRAPHY (CT) TO DEDUCE THE PHYSICAL DENSITY OF RESIN COMPOSITES TO WITHIN 2% ACCURACY AND TO DETECT ANOMALIES (DELAMINATIONS, DENSITY GRADIENTS, VOIDS) IN RESIN COMPOSITE STRUCTURES. CONCURRENTLY, MATERIAL PROPERTY-DENSITY RELATIONSHIPS WERE ESTABLISHED FOR GRAPHITE/BISMALEIMIDE DEMONSTRATING A SENSITIVITY RATIO OF 20%:1%. STRUCTURAL TESTING OF RESIN COMPOSITE RINGS SHOWED HIGH CORRELATION BETWEEN POINT OF FAILURE AND CT-DETECTED ANOMALY. ALL ELEMENTS NEEDED TO SUPPORT A FINITE ELEMENT ANALYSIS OF RESIN COMPOSITE STRUCTURAL RESPONSE HAVE BEEN DEMONSTRATED ON A FEASIBILITY BASIS. THE PHASE II PROGRAM WILL DEVELOP AN ENGINEERING TOMOGRAPHY CAPABILITY FOR GRAPHITE/BISMALEIMIDE. REFINEMENTS WILL BE MADE IN THE DENSITY MEASURING CAPABILITY OF CT. A COMPLETE MATERIALS PRO-

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PERTIES-DENSITY DEPENDENT MODEL WILL BE FORMULATED. CT AND OTHER COMPLEMENTARY NDE TECHNIQUES WILL BE USED TO DEFINE MATERIAL PROPERTIES AND ANOMAL CHARACTERISTICS. SOFTWARE WILL BE DEVELOPED TO SUPERIMPOSE CT DATA ON FINITE ELEMENT MODELS. NDE-DRIVEN FINITE ELEMENT ANALYSES WILL BE CONDUCTED ON LOADED COMPOSITE STRUCTURES CONTAINING DEFINED ANOMALIES. ANALYSIS OF AN NDE-INSPECTED, TESTED COMPONENT WILL COMPLETE THE ASSESSMENT.

PDA ENGINEERING AF
975 RED HILL AVE (OLD: 1560 BROOKHOLLOW)
COSTA MESA, CA 92626
CONTRACT NUMBER:
DR JOSEF E WUERER
TITLE:
DUST INDUCED LOADING EFFECTS ON HML
TOPIC# 236 OFFICE: BMO/MYSC

THE RESPONSE OF A HARD MOBILE LAUNCHER (HML) IS A NUCLEAR AIRBLAST ENVIRONMENT IS STRONGLY DEPENDENT ON THE DRAG LOADS PRODUCED BY THE TWO PHASE FLUID-PARTICLE GUST WHICH FOLLOWS THE BLAST FRONT. THE PRIMARY OBJECTIVE OF THE PROPOSED PROGRAM IS TO CONDUCT CREDIBLE AERO/DUST LOAD EXPERIMENTS ON REPRESENTATIVE HML TRANSPONDER CONFIGURATIONS IN A WIND TUNNEL. THE FEASIBILITY OF REALISTICALLY SIMULATING CRITICAL ELEMENTS OF THE HML BLAST WAVE ENVIRONMENT IN A WIND TUNNEL WAS ESTABLISHED IN THE RECENTLY COMPLETE PHASE I PROGRAM, "DUST INDUCED LOADING ON A HARD MOBILE LAUNCHER", CONTRACT NO. F04704-86-C-0099. THE SPECIFIC TECHNICAL OBJECTIVES OF THE PROPOSED PHASE II PROGRAM ARE AS FOLLOWS: (1) DEVELOP A DUST LOADED FLOW WIND TUNNEL CAPABILITY FOR BOTH SUBSONIC AND SUPERSONIC FLOW ENVIRONMENTS, (2) VALIDATE THIS CAPABILITY THROUGH THE CONDUCT OF COMPREHENSIVE CALIBRATION EXPERIMENTS; (3) CONDUCT LOADS TESTS IN BOTH DUST LOADED AND CLEAN AIR FLOWS FOR RELEVANT HML TRANSPORTER CONFIGURATIONS, AND (4) DEVELOP AN AERO/DUST LOADS DATA BASE.

PEM RESEARCH CO AF
3104 ROBERTA DR
LARGO, FL 33541
CONTRACT NUMBER:
DR RICHARD KENT SPEARS
TITLE:
HIGH TEMPERATURE ADHESIVES FOR REENTRY VEHICLES
TOPIC# 197 OFFICE: BMO/MYSC

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THIS PROJECT INVOLVES THE EXAMINATION OF ADHESIVE SYSTEMS WHICH WE FEEL TO BE FEASIBLE FOR USE IN BONDING HEATSHIELDS TO REENTRY VEHICLES. THE TYPES OF ADHESIVES TO BE EXAMINED ARE THOSE WHICH WILL CURE AT LOW TEMPERATURE BUT WHICH WILL EXHIBIT HIGH TEMPERATURE PROPERTIES. SPECIFICALLY EPOXIES, SILICONE RUBBERS, DICYANATE ESTERS AND ACRYLIC ESTERS ARE AMONG SYSTEMS WHICH WILL BE STUDIED. ALSO TO BE EXAMINED ARE THREE NOVEL CURING METHODS. THESE ARE RF CURING, MICROWAVE DURING AND RADIATION CURING. TO ACCOMPLISH THIS TWO TEST FIXTURES WILL BE BUILT WHICH WILL SUBJECT THE ADHESIVE BOND TO STRESS AND THERMAL CONDITIONS SIMILAR TO THAT SEEN DURING REENTRY. ANALYSIS BOTH EXPERIMENTALLY AND ANALYTICALLY WILL BE PERFORMED. ULTIMATELY TESTING IN THE HIGH TEMPERATURE ARC-JET FACILITY AT AEDC WILL BE USED TO EVALUATE THE BOND. THOUGHT WILL BE GIVEN TO THE ADAPTION OF THE PROCESS TO PRODUCTION TO THE POINT WHERE TENTATIVE MATERIALS SPECIFICATIONS, QUALITY ASSURANCE SPECIFICATIONS AND MANUFACTURING SPECIFICATIONS WILL BE WRITTEN. A NUMBER OF CONSULTANTS WILL BE USED TO ASSIST IN THE PROGRAM. THIS INCLUDED PERSONS FROM GOVERNMENT LABORATORIES, INDUSTRY AND UNIVERSITIES.

PENGUIN SOFTWARE INC ARMY
7005 E SPRING ST
LONG BEACH, CA 90808
CONTRACT NUMBER:
THOMAS H WEIGHT
TITLE:
A MICROCODE COMPILER THAT RUNS ON THE IBM AT AND SUPPORTS CASCADABLE MICROCOMPUTERS
TOPIC# 165 OFFICE: TECOM/WSMR

PENGUIN SOFTWARE HAS PROPOSED TO DELIVER AN END TO END DEMOSTRATION OF ITS APPROACH TO AUTOMATED MICROCODE GENERATION FOR CASCADED, SYSTOLIC AND PARALLED ARRAYS OF MICROCOMPUTER. MACHINE-DEPENDENT LANGUAGE WILL BE USED TO ALLOW AN ENGINEER TO INCORPORATE KNOWLEDGE OF MACHINE PARALLELISM. EASE OF RETARGETTING AND LANGUAGE DEFINITION WILL BE ACHIEVED BY USING A COMPILER DURING THE LANGUAGE DEFINITION PHASE AS WELL AS DURING THE MICROCODE GENERATION. DURING RECENT YEARS, PENGUIN SOFTWARE HAS CONDUCTED RESEARCH TO DEVELOP DATA STRUCTURES AND ALGORITHMS SUITABLE FOR USE IN A MICROCODE COMPILER WHICH CAN RUN ON A PERSONNEL COMPUTER. THESE EFFORTS HAVE RESULTED IN THE CAPABILITY OF GENERATING A MICROCODE COMPILER WHICH WILL RUN

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ON AN IBM-AT AND WILL EXECUTE IN TIMES COMPETITIVE WITH PRESENT DAY METS-ASSEMBLERS. OUR PHASE I MICROCOMPILER WILL BE UPGRADED TO USE HILEVEL TECHNOLOGY'S SALE AS AN INTERMEDIATE LANGUAGE FOR INCREASED FLEXIBILITY.

PERCEPTICS CORP AF
PO BOX 22991 - PELLISSIPPI CTR
KNOXVILLE, TN 37922
CONTRACT NUMBER: F33615-87-C-1519
JOSEPH A VRBA
TITLE:
KNOWLEDGE-BASED DECISION TREE GENERATION
TOPIC# 116 OFFICE: AFWAL/AA

A SYSTEM IS PROPOSED FOR THE UTILIZATION OF EXPERT KNOWLEDGE TO GENERATE HIGHLY EFFICIENT SOLUTIONS TO DECISION-MAKING PROBLEMS. STARTING FROM EITHER A PRODUCTION RULE OR A DECISION TREE REPRESENTATION OF THE PROBLEM, AS SUPPLIED BY A SYSTEM DESIGNER, THE EXPERT DECISION TREE GENERATOR SYSTEM CAN PRODUCE AN EFFICIENT DECISION TREE REPRESENTATION. THE USER CAN THEN EXPLORE SOME OF THE POSSIBLE OPTIMAL SOLUTIONS TO THE PROBLEM, CHOOSING THE CONSIDERED BEST SUITED FOR THE PARTICULAR APPLICATION. THE SYSTEM IS ALSO CAPABLE OF GENERATING HIGH-LEVEL LANGUAGE CODE (C OR ADA) THAT IMPLEMENTS A DECISION TREE REPRESENTATION. THE PURPOSE OF THIS INVESTIGATION IS TO DEVELOP AND IMPLEMENT A SET OF ALGORITHMS THAT CAN BE USED FOR THE SYNTACTIC MANIPULATION OF DECISION TREES AND THE GENERATION OF ALL THE OPTIMAL FORMS OF A DECISION TREE. THESE ALGORITHMS ARE ALSO CAPABLE OF HANDLING TERMS IN DECISION THEORIES WITH BOTH DEPENDENCIES AND VARIABLES. THE RESULT IS A PROBLEM-SOLVING APPROACH WHERE CONCEPTUAL AND EXPERT KNOWLEDGE RATHER THAN HEURISTIC ARE THE DRIVING FORCE IN THE DESIGN AND IMPLEMENTATION OF EFFICIENT DECISION-MAKING PROCESSES.

PERCEPTICS CORP AF
PELLISSIPPI CTR
KNOXVILLE, TN 37922
CONTRACT NUMBER:
JOSEPH A VRBA
TITLE:
INTERACTIVE KNOWLEDGE-BASED SENSOR FUSION
TOPIC# 226 OFFICE: BMO/MYSC

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A SYSTEM IS PROPOSED FOR THE ACQUISITION OF CLASSIFICATION KNOWLEDGE FROM MULTISENSOR DATA TO GENERATE, AUTOMATICALLY, EFFICIENT SOLUTIONS TO PROBLEMS IN TARGET DETECTION AND CLASSIFICATION. THIS WORK REPRESENTS A FORMALIZED ATTEMPT TO DEVELOP A METHODOLOGY FOR ANALYZING MULTISENSOR DATA. THE RESULT IS A METHODOLOGY FOR AUTONOMOUS MACHINE LEARNING THAT IS INCREMENTAL IN NATURE. STARTING FROM TOTAL IGNORANCE, THE SYSTEM'S KNOWLEDGE IS SUCCESSIVELY IMPROVED EVERY TIME IT PROESSES NEW SENSOR DATA OR ACCEPTS HUMAN EXPERT KNOWLEDGE AND RULES OF THUMB AS KNOWN FACTS. ONCE THE NECESSARY CLASSIFICATION KNOWLEDGE HAS BEEN ACQUIRED, AN EFFICIENT REPRESENTATION OF THE CORRESPONDING SOLUTION CAN BE GENERATED AUTOMATICALLY. FROM IT, A C LANGUAGE IMPLEMENTATION OF THE ACQUIRED CLASSIFICATION KNOWLEDGE CAN ALSO BE PRODUCED. THE PURPOSE OF THIS INVESTIGATION IS TO DEVELOP AND IMPLEMENT AN INTERACTIVE, DATA-DRIVEN LEARNING TOOL TO BE USED IN THE DESIGN AND TEST OF KNOWLEDGE-BASED SENSOR FUSION SYSTEMS.

PERCEPTICS CORP ARMY
PO BOX 22991 - PELLISSIPPI
KNOXVILLE, TN 37933
CONTRACT NUMBER:
JOSEPH A VRBA
TITLE:
APPLICATION OF EXPERT SYSTEMS AT WHITE SANDS MISSILE RANGE
TOPIC# 172 OFFICE: TECOM/WSMR

A PROTOTYPE SYSTEM HAS BEEN DEVELOPED FOR THE UTILIZATION OF EXPERT KNOWLEDGE TO GENERATE HIGHLY EFFICIENT SOLUTIONS TO DECISION-MAKING PROBLEMS. STARTING FROM A PRODUCTION RULE REPRESENTATION OF THE PROBLEM, AS SUPPLIED BY A SYSTEM DESIGNER, THE EXPERT DECISION TREE GENERATOR SYSTEM CAN PRODUCE AN EFFICIENT DECISION TREE REPRESENTATION. THE USER CAN THEN EXPLORE SOME OF THE POSSIBLE OPTICAL SOLUTIONS TO THE PROBLEM, CHOOSING THE ONE BEST SUITED FOR THE PARTICULAR APPLICATION. THE SYSTEM IS ALSO CAPABLE OF GENERATING HIGH-LEVEL LANGUAGE CODE (C) THAT IMPLEMENTS A DECISION TREE REPRESENTATION. THE PURPOSE OF PHASE II OF THIS INVESTIGATION IS TO MIGRATE THE SYSTEM INTO THE MORE COST-EFFECTIVE PERSONAL COMPUTER ENVIRONMENT WHILE IMPROVING ITS USER INTERFACE. IN ORDER TO ACHIEVE THIS GOAL, THE LANGUAGE INTERFACE THAT ACCEPTS INPUT FROM THE USER WILL BE ENHANCED; A MEANS FOR DIRECT ENTRY OF DECISION TREES WILL BE PROVIDED; TECHNIQUES TO ALLOW THE INTERACTIVE ACQUISITION OF APPLICATION SPECIFIC

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INFORMATION WILL BE DEVELOPED; AND MONOCHROMATIC GRAPHICS CAPABILITIES TO ENHANCE THE REPRESENTATION OF TREES AND PRODUCE A MORE USER-FRIENDLY INTERFACE WILL BE ADDED. IN ADDITION, THE SYSTEM WILL BE TESTED EXTENSIVELY AND THEN USED TO DESIGN AND IMPLEMENT EXPERT SYSTEMS AT WSMR.

PERFECT VIEW INC (OLD: COAL GAS INC) AF
532 PYLONG DR
RALEIGH, NC 27606
CONTRACT NUMBER:
DR A J ATTAR
TITLE:
LOW-COST INDICATOR AND DOSIMETER FOR WARFARE GASES
TOPIC# 89 OFFICE: ASD/AE

THE DEVASTATING EFFECTS OF WARFARE GASES (WG), AS WELL AS THE DEBILITATING EFFECT OF THE FEAR OF EXPOSURE, CAN DETERMINE THE OUTCOME OF A MILITARY ENCOUNTER. EVEN THOUGH SOME TREATMENTS MAY BE PARTIALLY EFFECTIVE IN SPECIFIC CIRCUMSTANCES, IT IS EXTREMELY IMPORTANT TO HAVE A SIMPLE, SMALL AND LIGHT-WEIGHT DEVICE THAT CAN TELL ON-SITE THE INDIVIDUAL SOLDIER WHETHER OR NOT HE IS EXPOSED TO WG AND TO WHICH TYPE (NEVER GAS (NG) OR A MUSTARD GAS (MG)). IN PHASE I, WE DEVELOPED A LOW COST THIN WAFER, 3"x2"x1/8", WHICH CHANGES ITS COLOR FROM WHITE TO RED WHEN EXPOSED TO CONCENTRATIONS OF THE ORDER OF 2-10 MICROGM/LIT. OF NERVE-GAS SIMULTANTS IN THE 20-60 SECONDS EVEN AT 18 C (PATENT #1 PENDING). THE MAIN OBJECTIVES OF THE PROPOSED PROJECT ARE TO FOLLOW ON OUR INITIAL PHASE I FINDINGS AND TO PRODUCE A WAFER WHICH CAN BE USED RELIABLY AND CONSISTENTLY BY INDIVIDUAL SOLDIERS TO DETERMINE WHETHER THEY ARE EXPOSED TO NERVE OR MUSTARD GASES. TO THIS END WE SHALL (1) CONDUCT ADDITIONAL RESEARCH TO OPTIMIZE THE DETECTION CHEMISTRY AND THE WAFER STRUCTURE; (2) DEVELOP MANUFACTURING PROCEDURES SO THAT PILOT-SIZE NUMBER OF WAFERS CAN BE PRODUCED IN A CONSIST AND RELIABLE MANNER; (3) CONDUCT TESTS TO DETERMINE THE PERFORMANCE PARAMETERS OF THE WAFER AND TO RANGE OF CONDITIONS IN WHICH THEY MAY BE USED; (4) TEST THE WAFER WITH ACTUAL MILITARY GASES. THE PROJECT WILL BE CONDUCTED OVER A PERIOD OF TWO YEARS, AT THE END OF WHICH, WE SHALL HAVE A RELIABLE WG DETECTOR WAFER WHICH INDIVIDUALS MAY USE TO DETERMINE WHETHER THEY ARE EXPOSED TO WG.

PERFORMANCE METRICS INC AF
5825 CALLAGHAN - STE 225
SAN ANTONIO, TX 78228
CONTRACT NUMBER: F33515-87-C-0616
DR BENJAMIN A FAIRBANK JR
TITLE:
A PERFORMANCE ASSESSMENT AND MEASUREMENT MODULE
TOPIC# 282 OFFICE: AMD/RDO

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COMPLETION OF THE PROPOSED WORK WILL RESULT IN A PROGRAM PACKAGE FOR THE ASSESSMENT AND MEASUREMENT OF HUMAN PERFORMANCE. THE PACKAGE WILL HAVE THREE FEATURES. FIRST, IT WILL INCLUDE PROGRAMS TO IMPLEMENT A NEWLY DEVELOPED PSYCHOMETRIC SUBJECT AREA, THAT OF WITHIN-SUBJECT PSYCHOMETRICS, OR THE MEASUREMENT OF THE MAGNITUDE AND SIGNIFICANCE OF DAY-TO-DAY CHANGES IN AN INDIVIDUAL'S PERFORMANCE. SECOND, IT WILL PROVIDE AN INTEGRATED SET OF PROGRAMS, THE GENERAL PURPOSE SCORING SYSTEM, USED TO MEASURE MANY OF THE ASPECTS OF HUMAN BEHAVIOR WHICH HAVE BEEN SHOWN TO HAVE THEORETICAL SIGNIFICANCE WITHIN VARIOUS AREAS OF COGNITIVE PSYCHOLOGY. FINALLY, IT WILL PROVIDE ACCESS TO A DATA BASE STRUCTURE WHICH WILL RECORD THE LEARNING AND PERFORMANCE HISTORY OF INDIVIDUALS IN INNOVATIVE WAYS IN ORDER TO PROVIDE USEFUL INFORMATION TO A COMPUTER-AIDED INTENTIONAL TUTOR. THE THREE AREAS, WITHIN-SUBJECT PSYCHOMETRICS, THE GENERAL PURPOSE SCORING SYSTEM, AND THE DATA BASE, WILL WORK TOGETHER AS AN INTEGRATED FUNCTIONAL PACKAGE.

PHYSICAL RESEARCH INC AF
25500 HAWTHORNE BLVD - STE 2300
PALOS VERDES, CA 90505
CONTRACT NUMBER: F33615-87-C-3018
DR CHIUN WANG
TITLE:
AN EVAPORATION-CONDENSATION SMOKE GENERATION SYSTEM
TOPIC# 289 OFFICE: AEDC/DOT

A SMOKE GENERATOR INCORPORATING THE TECHNIQUES OF LIQUID VAPORIZATION, FORCED CONVECTIVE COOLING, PARTICLE-SIZE CONTROL, AND PROGRAMMABLE ELECTRONIC CONTROL WILL BE DEVELOPED FOR AFWAL/SARL FACILITY. LIQUID CHEMICALS WILL BE ATOMIZED MECHANICALLY BY AN ULTRASONIC ATOMIZER. THE ATOMIZED LIQUID WILL BE EVAPORATED BY AN ELECTRICAL HEATER OPERATED AT CONSTANT TEMPERATURE, AND THE LIQUID VAPOR WILL BE MIXED WITH AIR SUPPLIED BY A BLOWER RUNNING AT VARIABLE SPEED. THE VAPOR-AIR MIXTURE WILL THEN BE COOLED BY A CONSTANT-TEMPERATURE BATH TO PRODUCE SMOKE. THE LIQUID FLOW-RATE, ATOMIZER AND ELECTRIC HEATER POWER INPUT, VAPOR-AIR MIXING RATIO, AND CONVECTIVE COOLING RATE WILL BE REGULATED SIMULTANEOUSLY USING AN INDUSTRIAL ELECTRONIC PROGRAMMABLE CONTROLLER SO THAT THE SMOKE CONCENTRATION CAN BE OPTIMIZED. THE CONTROLLER WILL ALSO BE USED TO GOVERN THE SMOKE INJECTION SPEED AND MATCH IT WITH THE SPEED OF THE WIND TUNNEL

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TO REDUCE TURBULENCE AND MINIMIZE SMOKE DISPERSION. MOREOVER, THE PROGRAMMABLE CONTROLLER WILL ALSO BE UTILIZED TO PROVIDE ADDITIONAL CAPABILITIES SUCH AS EVENT-SEQUENCING, SELF-DIAGNOSIS, AND EMERGENCY POWER SHUT-DOWN TO IMPROVE THE OPERATION AND SAFETY OF THE DEVICE.

PHYSICAL RESEARCH INC DNA
25500 HAWTHORNE BLVD - STE 2300
TORRANCE, CA 90505
CONTRACT NUMBER: DNA87-C-0283
DANIEL A MATUSKA
TITLE:
APPLICATION OF ADVANCED COMPUTER RESOURCES TO PLASMA PHYSICS CODES
TOPIC# 1 OFFICE: AM

THE PHASE I EFFORT HAS ESTABLISHED THE FEASIBILITY OF DEVELOPING AN ADVANCED PLASMA PHYSICS CODE OF IMPORTANCE TO DNA/RAAE FOR IMPROVE TREATMENT OF HIGH-ALTITUDE NUCLEAR EFFECTS WHICH ARE PRESENTLY INADEQUATELY TREATED DUE TO INHERENT APPROXIMATIONS AND SIMPLIFICATIONS IN EXISTING COMPUTER CODES. THE PROPOSED PHASE II RESEARCH WILL RESULT IN AN IMPROVED TREATMENT OF EARLYTIME PHENOMENOLOGY FOLLOWING MEGATON BURSTS AT ABOUT 200 km ALTITUDE. SUCH PHENOMENOLOGY MUST BE TREATED IN A FIRST-PRINCIPLES CODE AND CAN BE INCLUDED IN A CODE SPECIFICALLY ORGANIZED TO TAKE ADVANTAGE OF THE CORE SIZE AND CPU SPEED THAT IS AVAILABLE IN TODAY'S STATE-OF-THE-ART COMPUTERS. THE EFFORT CONSISTS OF FIVE TASKS REQUIRED FOR DEVELOPMENT, TESTING, EVALUATION AND DOCUMENTATION OF THE CODE.

PHYSICAL SCIENCES INC AF
PO BOX 3100 - RESEARCH PK
ANDOVER, MA 01810
CONTRACT NUMBER: F29601-87-C-0056
LAWRENCE G PIPER
TITLE:
LASER BASED DIAGNOSTIC FOR N2(X v)
TOPIC# 81 OFFICE: AFWL/PRC

IN THE PHASE II PROGRAM WE PROPOSE TO REFINE THE DIAGNOSTICS DEVELOPED AND TESTED IN OUR PHASE I EFFORTS. DURING PHASE I WE TESTED

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LASER BASED, NON-INTRUSIVE TECHNIQUES FOR DETECTING N(2)(X,v): a) MULTIPHOTON IONIZATION; b) LASER INDUCED FLUORESCENCE USING A (1)N(g) AS THE FLUORESCING STATE; AND c) OPTICAL DOUBLE RESONANCE IN WHICH N(2)(X,v) IS PUMPED TO A(3)E(+) WHICH IS GREATER THAN LASER EXCITED TO B(3)II, THE FLUORESCING STATE. (METHOD A WAS THE MOST SUCCESSFUL AND VIBRATIONAL LEVELS UP TO v"=14 WERE OBSERVED.) IN OUR PHASE II PROGRAM WE PROPOSE TO COMPARE THESE LASER BASED TECHNIQUES TO A PANNING IONIZATION METHOD WHICH CAN BE PUT ON AN ABSOLUTE BASIS FOR MEASURING N(2)(X,v). WE WILL ALSO EVALUATE THE DIAGNOSTICS USING SEVERAL DISTINCT N(2)(X,v) SOURCES. THESE SOURCES (H + NF(2)). THE DEMONSTRATION OF A MONITOR FOR CHEMICALLY PRODUCED N(2)(X,v) IS ESPECIALLY RELEVANT TO SHORT WAVELENGTH CHEMICAL LASER DEVELOPMENT. WE ALSO PROPOSE TO APPLY OUR DIAGNOSTIC TECHNIQUE TO A SYSTEM CONTAINING N(2)(X,v) AND A POTENTIAL LASER TRANSFER PARTNER TO DEMONSTRATE THAT N(2)(X,v) KINETICS CAN BE STUDIED.

PHYSICAL SCIENCES INC ARMY
PO BOX 3100 - RESEARCH PK
ANDOVER, MA 01810
CONTRACT NUMBER:
DAVID I ROSEN
TITLE:
ACTIVE INFRARED DETECTION OF PAVEMENT ICING
TOPIC# 201 OFFICE: CRREL/COE

A SERIES OF EXPERIMENTAL INVESTIGATIONS ARE PROPOSED TO IMPLEMENT AND DEMONSTRATE THE PAVEMENT ICE DETECTION CONCEPTS ORIGINALLY DEVELOPED IN THE PHASE I EFFORT. THE BASIC DETECTION SCHEME TO BE INVESTIGATED INVOLVES REMOTE ACTIVE INFRARED MONITORING OF THE PAVEMENT SURFACES. THE PRINCIPAL OBJECTIVE IS TO DEMONSTRATE THE PROPOSED OPTICAL DETECTION SCHEME UNDER REALISTIC ENVIRONMENTAL CONDITIONS AND FOR LENGTH SCALES, I.E., RANGES AND BEAM "FOOTPRINT" DIMENSIONS, APPROPRIATE TO ANTICIPATED APPLICATIONS.

PHYSICS MATHEMATICS & COMPUTERS INC NAVY
128 STALLION CIR
SOCORRO, NM 87801
CONTRACT NUMBER:
P D BUCKLEY/M L PERINI
TITLE:
FAST SHORTLINE TRACING FOR SURVIVABILITY/VULNERABILITY CODES
TOPIC# 107 OFFICE: NSWC/SSPO

SUBMITTED BY DEPT

THE PROPOSED PHASE II RESEARCH WILL DEVELOP A POINT-BURST VULNERABILITY/LETHALITY CODE BASED ON A VERY FAST RAY TRACER THAT WAS DEMONSTRATED IN PHASE I. A PENETRATION EQUATION ROUTINE, AND A Pk (KILL PROBABILITY) LOGIC ROUTINE WILL BE ADDED TO THE RAY TRACER TO MAKE IT A COMPLETE VULNERABILITY/LETHALITY CODE, WHICH WILL THEN BE COMPARED TO EXISTING METHODS FOR SEVERAL EXAMPLE CALCULATIONS. THE CRITICAL SECTIONS OF CODE WILL SUBSEQUENTLY BE MICROCODED INTO SPECIAL PURPOSE HARDWARE TO SPEED UP THE CALCULATIONS. FINALLY, PARALLEL PROCESSOR ARCHITECTURES WILL BE EVALUATED FOR APPLICATION TO THE NEW POINT-BURST CODE.

PHYSICS MATHEMATICS & COMPUTERS INC AF
128 STALLION CIR
SOCORRO, NM 87810
CONTRACT NUMBER:
P D BUCKLEY & M L PERINI
TITLE:
A GRAPHICS WORKSTATION FOR WEAPON ENGINEERS
TOPIC# 256 OFFICE: BMO/MYSC

THIS RESEARCH WILL DEMONSTRATE THE CONCEPT OF A HIGH PERFORMANCE, STAND ALONE GRAPHICS WORKSTATION FOR WEAPON SCIENTISTS AND ENGINEERS. SOFTWARE WILL BE DEVELOPED TO CREATE TARGET MODELS, TO CREATE WARHEAD MODELS, AND TO SIMULATE THE TERMINAL ENGAGEMENT INTERACTION OF WARHEADS WITH TARGETS. THE HIGH PERFORMANCE GRAPHICS WORKSTATION WILL DISPLAY THE RESULTS OF THE APPLICATIONS SOFTWARE WITH HIGH QUALITY GRAPHICS IMAGES, USING SMOOTH SHADING, LIGHT SOURCES, TEXTURE, ETC., TO ADD REALISM AND DEPTH TO THE IMAGES.

PI INC AF
PO BOX 442
REDONDO BEACH, CA 90277
CONTRACT NUMBER: 87-16115
DR RAYMOND P CHEUNG
TITLE:
SMART-MUX FOR DIGITAL MICROWAVE SYSTEMS
TOPIC# 28 OFFICE: AD/YII

MANY MILITARY COMMUNICATION SYSTEMS REQUIRE TRANSMITTING DATA AT

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NON-STANDARD RATES UP TO 2.2 Mbps. A SMART-MUX CAN BE DEVELOPED TO ALLOW MULTIPLEXING OF TELEMETRY AND OTHER HIGH-SPEED DATA STREAMS (AT DATA RATES BETWEEN 600 Kbps AND 2.2 Mbps) FOR TRANSMISSION OVER EXISTING DIGITAL MICROWAVE SYSTEMS UTILIZING TWO OR MORE T1 LINES AND/OR AT THE DS-2 LEVEL. INNOVATIVE WORD-STUFFING TECHNIQUE AND ADVANCE SYNCHRONIZATION METHOD ARE USED IN THE PROPOSED DESIGN IN WHICH THE INPUT DATA SEQUENCE IS FORMATTED INTO CHANNEL WORD. CHANNEL WORD IS THEN TRANSMITTED ONCE IN EACH DATA FRAME OF THE TRANSMITTING DATA STREAM. BY ADJUSTING THE WORD RATE, TOGETHER WITH WORD-STUFFING, THE MUX CAN OPERATE AT VARIABLE INPUT DATA RATES. THE SMART MUX CONCEPT DEVELOPED BY THE AIR FORCE HAS BEEN ANALYZED DURING THE PHASE I STUDY AND SHOWN TO BE FEASIBLE WITH RELATIVE SIMPLE HARDWARE DESIGN. TWO ENGINEERING UNITS ARE PROPOSED AS PHASE II EFFORT TO DEMONSTRATE AND TEST IN THE EXISTING MICROWAVE RADIO SYSTEM IN EGLIN AFB, FL FOR THE DURATION OF 12 MONTHS.

PLANNING SYSTEMS INC NAVY
7925 WESTPARK DR
McLEAN, VA 22102
CONTRACT NUMBER: N00039-88-C-0154
DAVID JAARSMA
TITLE:
SIGNAL PROCESSING: BROADBAND CROSS-CORRELATION WITH DOPPLER COMPENSATION
TOPIC# 40 OFFICE: SPAWAR

NARROWBAND SPECTRAL ANALYSIS IS AN IMPORTANT SIGNAL PROCESSING APPROACH FOR THE DETECTION OF TARGETS/OBJECTS THAT MAY BE IMBEDDED IN VARIOUS TYPES OF NOISE BACKGROUNDS. HOWEVER, THE SPECTRA EMITTED BY MANY TARGETS/OBJECTS IS BROADBAND IN NATURE, AND REQUIRES A DIFFERENT SIGNAL PROCESSING APPROACH TO MAXIMIZE PROBABILITY OF DETECTION FOR A FIXED PROBABILITY OF FALSE ALARM. THE OBJECTIVE OF THE PHASE I EFFORT WAS TO DETECT/TRACK A TARGET THAT RADIATED ONLY BROADBAND ENERGY. THE SIGNAL WAS ASSUMED TO BE A BROADBAND GAUSSIAN PROCESS. THE SIGNAL WAS OBSERVED ON TWO SPATIALLY-DISTRIBUTED SENSORS, EACH OF WHICH CONTAINED ADDITIVE BUT INDEPENDENT BROADBAND GAUSSIAN NOISE. THE PHASE I EFFORT LED TO A BROADBAND DETECTOR/TRACKER THAT USED A NORMALIZED CROSS-CORRELATION TERM AS THE DETECTION STATISTIC TO DETECT AND TRACK BOTH SIGNAL DOPPLER AND TIME DELAY. THE DETECTOR/TRACKER IS IMPLEMENTED AS A SOFTWARE TESTBED ON

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A VAX 8200. THE PHASE II EFFORT WILL REFINE THIS TESTBED, EXAMINE OTHER DETECTOR STRUCTURES, AND EXHAUSTIVELY TEST AND EVALUATE THE TESTBED DESIGN USING BOTH SIMULATED AND REAL SEA DATA. THE MOST INTENSIVE AND REPETITIVE SIGNAL PROCESSING TASKS WILL BE IMPLEMENTED ON AN FPS 5205 ARRAY PROCESSOR. THE TESTBED WILL DETECT BROADBAND PHENOMENA, AND ESTIMATE BOTH DOPPLER RATIO AND DIFFERENTIAL TIME DELAY.

POWER SPECTRA INC NAVY
42660 CHRISTY ST
FREMONT, CA 94538
CONTRACT NUMBER:
LARRY RAGLE
TITLE:
OPTICALLY ACTIVATED AVALANCHE MODE BULK SEMICONDUCTOR SWITCH
TOPIC# 3 OFFICE: ONR

THE CONTRACTOR WILL INVESTIGATE OPTICALLY ACTIVATED GaAs BULK SEMICONDUCTOR SWITCHES BIASED CLOSE TO AVALANCHE BREAKDOWN. THE PERFORMANCE SPECIFICATIONS ARE PULSE AMPLITUDES OF 1 KILOVOLT, PULSE DURATIONS OF 100 PICOSECONDS, AND SWITCH LIFETIMES OF 1000 HOURS AT 1 KILOHERTZ REPETITION RATES.

PREDICTION SYSTEMS INC ARMY
200 ATLANTIC AVE
MANASQUAN, NJ 08736
CONTRACT NUMBER:
ROBERT E WASSMER
TITLE:
INTERACTIVE SYMBOLIC SIMULATOR FOR RAPID ANALYSIS COMMUNICATIONS SYSTEMS
TOPIC# 48 OFFICE: CECOM/AMSEL

AFTER SUCCESSFULLY DEMONSTRATING THE FEASIBILITY OF USING MODERN GRAPHIC TECHNIQUES AS PART OF A SET OF MODELING AND SIMULATING TOOLS FOR ARMY COMMUNICATIONS SYSTEMS ANALYSIS AND PROVIDING A SIMULATION CAPABILITY ON A DISTRIBUTED PROCESSOR SYSTEM IN SUPPORT OF THE GRAPHIC LAYDOWNS AND ANALYSES, PSI WILL EXTEND, IMPLEMENT AND APPLY THESE GRAPHIC MODELING AND SIMULATION TOOLS TO CRITICAL ARMY

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COMMUNICATION SYSTEMS. IN THIS PHASE II PROGRAM, THE PHASE I GRAPHIC TECHNIQUES WILL BE APPLIED TO CURRENT MSE SIMULATIONS FOR CONNECTIVITY AND CAPACITY STUDIES AT THE CORPS AND EAC LEVELS. USING THE MODULARITY CHARACTERISTICS OF THE GSS SIMULATION LANGUAGE, MORE SYSTEM MODELS WILL BE ADDED TO THE KNOWLEDGE BASE TO PROVIDE AN MSRT SIMULATION. SEVERAL OF THE RESTRICTIONS OBSERVED IN PHASE I, SUCH AS THE INTERFACE SPEED, WILL BE REMOVED TO TUNE OVERALL SYSTEM PERFORMANCE. MODELING AND SIMULATION LIBRARIES FOR GRAPHIC TOOLS WILL BE EXPANDED TO PROVIDE COST EFFECTIVE GRAPHIC TECHNIQUES TO THE COMMUNICATIONS SYSTEM ANALYST. THESE MIGHT INCLUDE USE OF FALSE COLORS, RAPID ACCESS TO SIMULATION DATABASES, PAN AND ZOOM. THROUGHOUT THE PROGRAM, HARDWARE INDEPENDENCE WILL BE MAINTAINED AND THE USE OF GENERALLY AVAILABLE THIRD PARTY SOFTWARE AND HARDWARE PRODUCTS WILL BE ENCOURAGED.

PRINCETON SCIENTIFIC INSTRUMENTS INC ARMY
306 ALEXANDER ST
PRINCETON, NJ 08540
CONTRACT NUMBER:
A DANFORTH COPE
TITLE:
ANGULAR MOTION SENSOR FOR CANNON MUZZLE
TOPIC# 154 OFFICE: LABCOM/BRL

IN PHASE I AN AUTOCOLLIMATOR TYPE INSTRUMENT WITH ELECTRONIC READOUT WAS DEVELOPED FOR DYNAMICALLY MEASURING THE CANNON MUZZLE PITCH AND YAW WHILE A TANK IS IN MOTION. A SMALL MIRROR MOUNTED ON THE MUZZLE IS VIEWED BY A TELESCOPE MOUNTED ON THE CANNON TRUNNION. A SPOT OF LIGHT REFLECTED BY THE MIRROR IS DETECTED BY A SOLID STATE POSITION SENSOR. TESTS OF A BREADBOARD OF THIS CONTINUOUS MUZZLE REFERENCE SYSTEM (CMRS) AT ABERDEEN PROVING GROUNDS TRANSONIC RANGE SHOW THAT THE MUZZLE MOTION CAN BE MEASURED WITH A PRECISION EXCEEDING 50 MICRORADIANS AT A BANDWIDTH OF 2000 Hz, THE PHASE I REQUIREMENTS. IN PHASE II IT IS PROPOSED THAT CMRS OPTICS AND ELECTRONIC DESIGN BE OPTIMIZED AND A RUGGEDIZED CMRS BUILT AND QUALIFIED BY FIELD TESTING ON A MOVING TANK.

PROGRAMMING ENVIRONMENTS INC ARMY
4043 STATE HWY 33
TINTON FALLS, NJ 07753
CONTRACT NUMBER:
ROBERT M POSTON
TITLE:
T2 PROTOTYPE: AUTOMATIC TEST GENERATOR FOR LARGE SOFTWARE SYSTEMS
TOPIC# 76 OFFICE: CECOM/AMSEL

SUBMITTED BY DEPT

THE LACK OF HIGH-RELIABILITY SOFTWARE IS A MAJOR PROBLEM IN MILITARY AND COMMERCIAL COMMUNITIES TODAY. FOR YEARS PRIOR TO PHASE I, PEI HAD BEEN WORKING ON A WAY TO PREVENT ERRORS IN SOFTWARE AND ULTIMATELY HAD DEVELOPED A TOOL CALLED T WHICH AUTOMATICALLY GENERATES TEST CASES BEFORE THE DEVELOPER BEGINS DESIGN -- A GIANT STEP TOWARD DESIGNING OUT ERRORS. T WORKS ON SMALL COLLECTIONS OF CODE. PHASE I FEASIBILITY STUDY FINDINGS REVEALED THE HIGH PROBABILITY THAT AN ENHANCED OR EXPANDED VERSION OF T (TO BE CALLED T2) COULD IMPROVE SOFTWARE RELIABILITY BY INCREASING TEST COVERAGE ON LARGE SOFTWARE SYSTEMS. PEI PROPOSES A TWO-YEAR PHASE II PROJECT IN WHICH T2 WOULD BE DEVELOPED IN THREE BUILDS. THE ANTICIPATED RESULT OF PHASE II IS T2, A SOFTWARE TOOL THAT WILL RUN ON FOUR COMPUTER/OPERATING SYSTEM CONFIGURATIONS AND WILL AUTOMATICALLY DESIGN, GENERATE, TRACE, AND DOCUMENT TEST CASES. THIS AUTOMATED TEST GENERATION WILL ELIMINATE HOURS OF WORK AND REWORK, AND THE TESTS CREATED WILL ENABLE SIGNIFICANTLY HIGHER TEST COVERAGE THAN FOUND ON PRESENT MILITARY PROJECTS.

PROMETHEUS INC AF
103 MANSFIELD ST
SHARON, MA 02067
CONTRACT NUMBER: FQ8671-8601312
JAMES S BYRNES
TITLE:
NEW APPROACHES TO BEAMFORMING NULL STEERING AND FILTERING
TOPIC# 12 OFFICE: AFOSR/XOT

CONTINUING OUR ATTACK UPON THE MANY FASCINATING UNSOLVED PROBLEMS IN ARRAY SHADING AND FILTERING, DURING PHASE II, WE WILL FURTHER APPLY THE SEMINAL KNOWLEDGE OF PROMETHEUS PERSONNEL, IN THE FIELD OF POLYNOMIALS WITH RESTRICTED COEFFICIENTS, TO SUCH AREAS AS ADAPTIVE FILTERING, BEAMFORMING, NULL STEERING, NOTCH FILTER DESIGN, PEAK POWER LIMITED TRANSMITTING, THE DESIGN AND APPLICATION OF REFLECTION PHASE GRATINGS, AND WAVELET CONSTRUCTION. ADDITIONALLY, WE WILL DESIGN AND BUILD A PROTOTYPE COMPILER TO TRANSLATE SPECIFICATIONS STATED IN A NATURAL LANGUAGE FOR ENGINEERS INTO EXECUTABLE CODE IN THE FORM OF A CONVEX PROGRAM OR AN APPROPRIATE LINEAR PROGRAM, AND TOOLS TO IMPLEMENT THIS CONVEX PROGRAMMING APPROACH TO THE PROBLEM OF CHOOSING ANTENNA ARRAY WEIGHTS.

PROSPECTIVE COMPUTER ANALYSTS INC ARMY
1800 NORTHERN BLVD
ROSLYN, NY 11576
CONTRACT NUMBER:
R GLENN WRIGHT
TITLE:
EXPERT SYSTEM FOR TPS FAULT CANDIDATE SELECTION
TOPIC# 14 OFFICE: ARDEC/SMCAR

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TEST PROGRAM SET VERIFICATION AND VALIDATION IS A HIGHLY LABOR INTENSIVE AND TIME CONSUMING ACTIVITY. AN AUTOMATED MEANS OF PERFORMING THIS EFFORT USING KNOWLEDGE-BASED TECHNIQUES TO EXAMINE TEST PROGRAM STRUCTURE AND UUT ARCHITECTURE, DETECT TEST PROGRAM DISCREPANCIES AND GENERATE A FAULT LIST WHICH MINIMIZES UUT FAULT INSERTIONS FOR TESTING IS PROPOSED TO ENHANCE THE EFFICIENCY OF THIS PROCESS. THIS PROPOSAL DESCRIBES AN APPROACH FOR THE DEVELOPMENT OF AN EXPERT SYSTEM TO ASSIST IN PERFORMING SOFTWARE QUALITY ASSURANCE IN THE VERI- EDITORS AND GRAPHICS GENERATORS, AND DEBUGGING TOOLS USED FOR THE FICATION, VALIDATION AND ACCEPTANCE OF TEST PROGRAM SETS. THE EXPERT SYSTEM THAT WILL RESULT FROM THE COMPLETION OF THE SBIR PHASE II EFFORT WILL INCORPORATE DATA PROCESSING IN CONJUNCTION WITH EXPERT RULES TO ANALYZE TEST PROGRAM STRUCTURE AND UNIT UNDER TEST (UUT) ARCHITECTURE IN PROGRAM EFFICIENCY AND CONTRACTUAL REQUIREMENT COMPLIANCE FOR AMBIGUITY GROUP SIZE, FAULT ISOLATION AND OTHER SPECIFIED PARAMETERS. IN ADDITION, EXPERT RULES WILL BE APPLIED TO SELECT UUT COMPONENTS MOST APPROPRIATE FOR INCLUSION IN A FAULT LIST FOR INSERTION DURING VERIFICATION AND VALIDATION TO DEMONSTRATE TEST PROGRAM ABILITY TO PROPERLY DETECT AND DIAGNOSE UUT FAILURES. THE EXPERT SYSTEM MAY BE APPLIED TO LINE REPLACEABLE UNITS (LRU), SHOP REPLACEABLE UNITS (SRRU) INCLUDING ANALOG, DIGITAL AND HYBRID; AND INTERFACE TEST ADAPTERS (ICD).

PRT CORP AF
245 E SIXTH ST - STE 424
ST PAUL, MN 55101
CONTRACT NUMBER: 85-150060
RALPH H McCARTNEY
TITLE:
POWER-AUGMENTED EXOSKELETON
TOPIC# 30 OFFICE: AD/YNS

THIS PROPOSAL DETAILS A DEVELOPMENT PROJECT WHICH WILL DEMONSTRATE A POWER-AUGMENTED EXOSKELETON. AN EXOSKELETON IS A JOINTED, EXTERNAL FRAMEWORK WORN BY A HUMAN OPERATOR IN WHICH ALL JOINTS ARE GIVEN A POWER-AUGMENTED ACTION. FORCE SENSORS DETECT USER MOVEMENTS AND, THROUGH MODERN FEEDBACK CONTROL TECHNIQUES, POWER THE EXOSKELETON LIMBS. A USER'S STRENGTH CAN THUS BE MAGNIFIED MANY TIMES WITHOUT LOSS OF DEXTERITY OR SPEED. THE PRIMARY PROJECT GOAL IS A SINGLE EXOSKELETON SUIT OPERATING IN "TETHERED" MODE (I.E. REQUIRING A

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POWER CABLE TO DELIVER ELECTRICAL ENERGY), A CUSTOM SET OF POWER GRIPPERS, A STORAGE FRAME, OTHER SUPPORT DEVICES, AND TRAINING AIDS. SUCCESSFUL COMPLETION WOULD LEAD TO COMMERCIAL PRODUCTION OF EXOSKELETON UNITS WITH SPECIALIZED ATTRIBUTES FOR VARIOUS MARKETS.

PULSE SCIENCES AF
14796 WICKS BLVD
SAN LEANDRO, CA 94577
CONTRACT NUMBER: F29601-87-C-
DR RICHARD J ADLER
TITLE:
ION FOCUSED MICROWAVE AMPLIFIER
TOPIC# 82 OFFICE: AFWL/PRC

A NOVEL COMBINATION OF THE NEW TECHNIQUE ON ION FOCUSING AND CONVENTIONAL TRAVELING WAVE TUBE TECHNOLOGY IS PROPOSED. IF SUCCESSFUL, THIS COMBINATION WILL MAKE GIGAWATT AMPLIFIERS IN THE GIGAHERTZ RANGE FEASIBLE. IN PHASE I WE DEMONSTRATED THE OPERATION OF A TRAVELING WAVE TUBE AMPLIFIER BUILT TO TEST THIS IDEA. THIS AMPLIFIER WAS OPERATED SUCCESSFULLY AT 300 kW, AND WITH UP TO 30 DB GAIN. THE DATA SUGGESTS THAT WITH IMPROVED COUPLING, MORE THAN 5% EFFICIENCY WAS POSSIBLE. IN PHASE II WE PROPOSE TO DO FURTHER EXPERIMENTS WITH .1-1 MW INPUT POWERS AND AN OUTPUT POWER GOAL OF 1 GW AT EFFICIENCIES OF >5%.

QUANSCAN INC ARMY
77 N OAK KNOLL AVE - #104
PASADENA, CA 91101
CONTRACT NUMBER:
PAUL E WEST
TITLE:
SCANNING TUNNELING MICROSCOPR FOR SUBMICRON DELINEATION IN SEMICONDUCTORS
TOPIC# 81 OFFICE: LABCOM/ETDL

SEMICONDUCTOR FEATURE SIZES WILL BE DECREASING FROM CURRENT ONE MICRON DIMENSIONS TO SUBMICRON DIMENSIONS IN THE NEAR FUTURE. EVEN DEVICES USING SINGLE MOLECULES FOR LOGIC FUNCTIONS ARE UNDER STUDY. THERE IS A GROWING CRITICAL NEED, BOTH IN MILITARY AND COMMERCIAL

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AREAS, FOR SYSTEMS CAPABLE OF IMAGING AND PROBING STRUCTURES WITH SUBMICRON FEATURE SIZES. SCANNING ELECTRON TUNNELING IS A NEW AND POWERFUL TECHNIQUE BEING USED FOR IMAGING SURFACE TOPOGRAPHY TO ATOMIC DIMENSIONS IN VACUUM, AMBIENT ATMOSPHERE, AND LIQUID. BEFORE AN INSTRUMENT INCORPORATING SUCH TECHNIQUES CAN BE PRACTICAL FOR IMAGING SUBMICRON FEATURES IN SEMICONDUCTORS, CERTAIN ADDITIONAL CAPABILITIES MUST BE ACHIEVED. THESE INCLUDE: INCREASING THE IMAGING AREA, DEVELOPING ADVANCED STAGING MECHANISMS, INCREASING THE TIP SCANNING RATE, AND DEVELOPING EFFECTIVE TECHNIQUES FOR IMAGING INSULATORS. QUANSCAN PROPOSES TO DEVELOP INNOVATIVE SOLUTION TO THESE PROBLEMS AND TO DESIGN, BUILD, AND TEST A PROTOTYPE SCANNING TUNNELING INSTRUMENT CAPABLE OF IMAGING SEMICONDUCTOR MATERIALS AND DEVICE STRUCTURES.

QUANTEX CORP SDIO
2 RESEARCH CT
ROCKVILLE, MD 20850
CONTRACT NUMBER:
DR JOSEPH LINDMAYER
TITLE:
NEW MATERIALS FOR OPTICAL COMPUTATIONS
TOPIC# 11 OFFICE:

A NEW CLASS OF OPTICAL SOLID STATE MATERIALS CALLED ELECTRON TRAPPING (ET/[TM]) MATERIALS HAVE BEEN DEVELOPED THAT ARE APPLICABLE TO OPTICAL DATA PROCESSING. THE ET(TM) EFFECTS CAN BE VIEWED AS AN ELECTRONIC QUANTUM STATE CHANGE INDUCED BY PHOTONS. UNDER THE PREVIOUS RESEARCH PHASE, EXPERIMENTAL THIN FILM AND THICK FILM SAMPLES OF ET(TM) MATERIALS WERE PREPARED AND EVALUATED AND THEIR BASIC BEHAVIOR WAS CHARACTERIZED. THESE COMPOUNDS DISPLAY UNUSUAL OPTICAL PROPERTIES OFFERING NEW OPPORTUNITIES FOR THE REALIZATION OF ERASABLE OPTICAL MEMORIES AND PARALLEL OPTICAL COMPUTING PROCESSORS. IN THE CURRENT RESEARCH PHASE, THE THIN FILM TECHNOLOGY IS BEING MATURED AS A BASE FOR ET(TM) DEVICE TECHNOLOGY FOR MASSIVELY PARALLEL ANALOG OPTICAL PROCESSORS; AN OPTICAL IMAGE CORRELATOR/COMPARATOR WILL BE FIRST EXAMINED AND USED TO DEMONSTRATE PARALLEL OPTICAL PROCESSING; THEN ET(TM) FILM DEVICES WILL BE GENERATED TO EXAMINE THE THREE-DIMENSIONAL ASPECTS OF IMAGE PROCESSING; AND THE RANGE-OF-OPERATION PARAMETERS AND DEVICE FABRICATIONS COST PARAMETERS WILL BE QUANTIFIED. THIS TECHNOLOGY, WHEN SUCCESSFULLY DEMONSTRATED, WOULD

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RESULT IN NEW, EXTREMELY HIGH DENSITY, ERASABLE PARALLEL OPTICAL PROCESSORS, AND VARIOUS OPTICAL IMAGE COMPARATORS AND IMAGE CORRELATORS.

QUANTEX CORP AF
2 RESEARCH CT
ROCKVILLE, MD 20850
CONTRACT NUMBER:
DR JOSEPH LINDMAYER
TITLE:
NEW PHOTONIC MATERIALS FOR DIGITAL PROCESSING
TOPIC# 94 OFFICE: ASD/XR

THIS PHASE II PROPOSAL CONCERNS RESEARCH AND DEVELOPMENT OF NEW OPTICAL MATERIALS OF CERTAIN II-VI COMPOUNDS FOR INFORMATION HANDLING. RECENT QUANTEX MATERIALS DEVELOPMENT HAVE SHOWN THAT SOME OF ITS NEW ELECTRON-TRAPPING (ET) MATERIALS CAN BE MADE IN THE FORM OF THIN FILMS WITH HIGH RESOLUTION. THEY ALSO SHOW LINEARITY OVER ORDERS OF MAGNITUDE IN CHARGING AND DISCHARGING THE TRAPS AS A FUNCTION OF LIGHT INTENSITIES. BESIDES STORING INFORMATION, THE NATURAL LINEARITY LEADS TO HIGH SPEED, HIGH RESOLUTION OPTICAL PROCESSORS AND OFFERS PARALLEL MULTIPLICATION AS WELL. AFTER SOME MATERIALS DEVELOPMENT, PARALLEL OPTICAL PROCESSORS BASED ON THE ET TECHNOLOGY WILL BE STUDIED. IT IS EXPECTED THAT BY THE END OF PHASE II OPTICAL PROCESSING WITH MEMORY WILL BE DEMONSTRATED TO THE POINT OF PRACTICAL USEFULNESS.

QUANTEX CORP AF
2 RESEARCH CT
ROCKVILLE, MD 20850
CONTRACT NUMBER:
CHARLES Y WRIGLEY
TITLE:
ELECTRON TRAPPING OPTICAL READ/WRITE ERASE MEMORY
TOPIC# 50 OFFICE: RADC/DOR

THIS PROPOSAL ADDRESSES THE PHASE II FURTHERANCE OF AN OPTICAL MEMORY MEMORY APPROACH WHICH IS INHERENTLY AMENABLE TO MULTI-LEVEL-DIGITAL OR ANALOG OPTICAL MASS DATA STORAGE. EFFORTS DURING THE PHASE I

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PROGRAM WITH MATERIALS RECENTLY DEVELOPED BY QUANTEX HAVE SHOWN THAT SOME OF ITS NEW ELECTRON-TRAPPING (ET) MATERIALS CAN PROVIE ALL-OPTICAL WRITE, READ, AND ERASE MEMORY FUNCTIONS WHICH ARE LINEAR OVER ORDERS OF MAGNITUDE OF THE WRITE ENERGY DEPOSITION. EACH MICROSCOPIC STORAGE LOCATION COULD THEREFORE STORE MANY BITS OF INFORMATION. THE BASIC FEASIBILITY OF SUCH MEMORIES EMPLOYING ET MEDIA HAS BEEN SHOWN IN PHASE I FOR OPERATION AT ROOM TEMPERATURE, WITH VERY FAST RESPONSE SPEEDS. PHASE II RESEARCH AND DEVELOPMENT CONTINUATION TO THE COMMERCIALIZATION-READINESS STAGE WOULD BRING ABOUT THE REALIZATION OF A NEW GENERATION OF OPTICAL MASS DATA STORAGE CAPABILITY IN EXTREMELY-HIGH-STORAGE-DENSITY FAST MEMORY SYSTEMS.

QUANTIC INDUSTRIES INC NAVY
990 COMMERCIAL ST
SAN CARLOS, CA 94070
CONTRACT NUMBER:
EDWARD A ROSE
TITLE:
NON-CONTACTING RANGING SYSTEMS FOR COLLISION AVOIDANCE
TOPIC# 65 OFFICE: NAVSEA

THE PRIMARY GOAL OF THIS PHASE II EFFORT IS TO EXTEND THE SUCCESSFUL TECHNOLOGY DEMONSTRATION OF A PHASE I STRUCTURED-LIGHT INVESTIGATION TO FULL PROTOTYPE IMPLEMENTATION, AND TO OPTIMIZE THE INNOVATION TO MEET THE NEEDS OF THE NAVY. THE OBJECTIVE IS TO DESIGN, FABRICATE, AND TEST A COLLISION-AVOIDANCE SENSOR WITH THE FOLLOWING CHARACTERISTICS: RANGE: 1 TO 100 FEET; RANGE ACCURACY: +/-5%; COMPLETE AZIMUTH: SCANNED; AZIMUTH ACCURACY: +/-10%; AND EMPLOY NO MOVING PARTS TO ACCOMPLISH SCANNING.

QUANTIC INDUSTRIES INC AF
990 COMMERCIAL ST
SAN CARLOS, CA 94070
CONTRACT NUMBER:
ROBERT L PROFFIT
TITLE:
KINETIC DELIVERY OF HIGH-EXPLOSIVE WARHEADS
TOPIC# 191 OFFICE: BMO/MYSC

SUBMITTED BY DEPT

FUTURE BALLISTIC MISSILE DELIVERY SYSTEMS WILL INCLUDE HIGH-EXPLOSIVE WARHEATS WHOSE FUZING SYSTEMS MUST SURVIVE HIGH INITIAL SHOCK LOADS AND DECELERATION PROFILES. FOR THIS PHASE II SBIR, QUANTIC WILL DESIGN, DEVELOP, AND TEST PROTOTYPE FUZES TO BE EMPLOYED IN HIGH-EXPLOSIVE, KINETIC-PENETRATION WARHEADS.

QUANTIC INDUSTRIES INC AF
990 COMMERCIAL ST
SAN CARLOS, CA 94070
CONTRACT NUMBER: F08635-87-C-0430
WILLIAM MARSHALL
TITLE:
THERMAL DELAY TIMER - ADVANCED TECHNOLOGY FUZE
TOPIC# 27 OFFICE: AFATL/MNF

AN ADVANCED FUZE TECHNOLOGY WILL BE DEVELOPED AND TESTED WHICH: ASSURES INTRINSICALLY LOWER PRODUCTION COSTS AND HIGHER RELIABILITY THROUGH THE REPLACEMENT OF ELECTROMECHANICAL AND PYROTECHNIC DEVICES WITH INTEGRATED ELECTRONICS; PROVIDES INCREASED SAFETY BY ELIMINATING ALL SENSITIVE EXPLOSIVES; SATISFIES INSENSITIVE MUNITIONS REQUIREMENTS; DERIVES ARMING AND FIRING ENERGY FROM THE ENVIRONMENT, THEREFORE ELIMINATING SAFING PINS; IS COMPATIBLE WITH HARD TARGET REQUIREMENTS; WILL USE STANDARD BOMB FUZE ENVELOPE AS DEVELOPMENT VEHICLE TO DEMONSTRATE AND ESTABLISH PARAMETERS REPRESENTATIVE OF FUTURE INSENSITIVE MUNITIONS. QUANTIC HAS DEMONSTRATED THE BASIC TECHNOLOGY UNDER PREVIOUS SBIR AND IR&D FUNDING. THE PROPOSED PHASE II EFFORT WILL DEVELOP AND VALIDATE THE DESIGN, FABRICATE ENGINEERING TEST HARDWARE, PERFORM ENGINEERING TESTS OVER SUITABLE ENVIRONMENTS, AND PROVIDE A LEVEL 2 DRAWING PACKAGE. AN OPTIONAL SECOND YEAR PHASE II EFFORT WOULD FULLY QUALIFY AND DOCUMENT THE DESIGN UP TO FLIGHT TESTING. THE PROPOSED FUZE TECHNOLOGY RESULTS FROM WORK PERFORMED UNDER AIR FORCE ARMAMENT LABORATORY (AFATL) AND BMO SBIR PHASE I CONTRACTS, AND WILL INCLUDE A CAPACITOR DEVELOPED FOR AFATL BY PINNACLE RESEARCH.

QUEST CO DARPA
15-F WOODLAND AVE
BLOOMFIELD, CT 06002
CONTRACT NUMBER:
DR NIKOLAY SHKOLNIK
TITLE:
DESIGN OF A LOW COST HIGH EFFICIENCY WALKING ROBOTIC VEHICLE (WRV)
TOPIC# 14 OFFICE: DARPA

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THERE ARE A NUMBER OF AREAS IN THE MILITARY, INDUSTRIAL COMMUNITY AS WELL AS AREAS OF PUBLIC SERVICE IN WHICH A LOW COST WALKING ROBOTIC VEHICLE (WRV) WOULD OFFER SIGNIFICANT ADVANTAGES OVER WHEELED OR TRACKED VEHICLES. ESPECIALLY IN AN UNSTRUCTURED ENVIRONMENT, WALKING MACHINES OFFER POTENTIAL FOR GREATLY IMPROVED MOBILITY IN COMPARISON TO WHEELED OR TRACKED VEHICLES. MOREOVER, WIDE AVAILABILITY OF LOW COST MOBILE ROBOTS WILL ACCELERATE THE PROGRESS OF RESEARCH AND DEVELOPMENT OF INTELLIGENT SYSTEMS. THE QUEST COMPANY IN PHASE II OF THIS PROJECT WILL DESIGN, FABRICATE, EVALUATE AND DEMONSTRATE A LOW COST, HIGH EFFICIENCY, MULTI-PURPOSE MOBILE WALKING ROBOTIC VEHICLE SUITABLE FOR EDUCATIONAL AND LABORATORY USE. IN ADDITION, THE WRV WILL BE ABLE TO MOVE ON STAIRS AS WELL AS IN MODERATELY UNSTRUCTURED OUTDOOR ENVIRONMENTS.

RADIATION MONITORING DEVICES INC ARMY
44 HUNT ST
WATERTOWN, MA 02172
CONTRACT NUMBER:
DR GERALD ENTINE
TITLE:
ENERGY COMPENSATED SOLID STATE GAMMA SENSOR
TOPIC# 72 OFFICE: CECOM/AMSEL

A KEY REQUIREMENT FOR THE SUCCESS OF NEW TACTICAL RADIATION DOSIMETRY INSTRUMENTATION NOW BEING DEVELOPED BY THE ARMY IS TO HAVE AN ENERGY COMPENSATED, SOLID STATE GAMMA RAY SENSOR. ATTEMPTS TO USE TRADITIONAL FILTERING TECHNIQUES TO ACHIEVE A FLAT ENERGY RESPONSE HAVE NOT BEEN SUCCESSFUL AND A NEW APPROACH IS REQUIRED. WE PROPOSE TO UTILIZE RECENTLY AVAILABLE, INEXPENSIVE DIGITAL MICROCHIPS TO ELECTRONICALLY CORRECT THE ENERGY DEPENDENCE OF A SOLID STATE SENSOR TO GIVE AN ENERGY COMPENSATED READOUT IN RADS (TISSUE). IN PHASE I OF THE PROGRAM, WE CARRIED OUT A DETAILED ANALYSIS OF THE RESPONSE OF A SILICON PIN DIODE TO RADIATIONS FROM ISOTOPIC AND X-RAY SOURCES, COVERING A WIDE RANGE OF ENERGIES AND FLUX RATES. WE HAVE DEVELOPED NUMERICAL ALGORITHMS REQUIRED TO CORRECT THE ENERGY DEPENDENCE OF THE RESPONSE AND EVALUATED THEIR POTENTIAL FOR APPLICATION IN A SIMPLE COMPACT DETECTION SYSTEM. IN PHASE II WE WILL COMPLETE THE DEVELOPMENT OF THE MATHEMATICS AND PRODUCE PROTOTYPE SYSTEMS WHICH WILL BE TESTED FOR ACCURACY, REPRODUCIBILITY, AND ENERGY RESPONSE. WE PLAN TO DELIVER SEVERAL PROTOTYPES FOR TESTING AT ARMY FACILITIES. BY THE

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END OF THE PROGRAM, AN INEXPENSIVE, FULLY TESTED DETECTOR AND ELECTRONIC DESIGN FOR THE GAMMA DOSE RATE SENSOR SHOULD BE READY FOR IMMEDIATE INCORPORATION INTO THE POCKET DOSIMETER OR OTHER PENDING ARMY NUCLEAR INSTRUMENTATION.

RASOR ASSOCS INC AF
253 HUMBOLDT CT
SUNNYVALE, CA 94089
CONTRACT NUMBER: F33615-87-C-2811
NED S RASOR
TITLE:
THERMIONIC CONVERTER TECHNOLOGY FOR MULTIMEGAWATT SPACE BURST POWER
TOPIC# 180 OFFICE: AFWAL/PO

AS EXPERIMENTALLY DEMONSTRATED IN THE USSR, THERMIONIC CONVERTERS CAN GENERATE VERY HIGH POWER DENSITIES (30-150 w/cm(2)) AND HIGH EFFICIENCIES (25-35%) AT VERY HIGH TEMPERATURES (2400-3000 K). IN PHASE I OF THIS SBIR, AN ANALYTICAL MODEL OF CONVERTER PERFORMANCE IN THIS NEW VERY-HIGH-TEMPERATURE-THERMIONIC (VHTT) REGIME WAS PREPARED AND USED TO MAP THE PROJECTED VHTT CONVERTER AND NUCLEAR SPACE POWER SYSTEM MAXIMUM PERFORMANCE ENVELOPES OVER POTENTIALLY ACHIEVABLE ELECTRODE PARAMETERS. THE PROJECTED PERFORMANCE OF VHTT CONVERTERS AND SYSTEMS USING ADLAYER METAL EMITTERS WAS FOUND TO BE SUPERIOR TO THE USSR BARE CARBIDE EMITTER APPROACH, AND TO GIVE CLOSED-CYCLE SPACE POWER SYSTEM MASSES APPROACHING THOSE OF OPEN-CYCLE BURST POWER SYSTEMS AND SUBSTANTIALLY LESS THAN OTHER OPEN-CYCLE ALERT POWER SYSTEM CONCEPTS. THE OBJECTIVE OF THE PROPOSED PHASE II PROJECT IS TO DEVELOP A SUPERIOR U.S. TECHNOLOGY BASE FOR VHTT CONVERTERS USING ADLAYER METAL ELECTRODES, TO EXPERIMENTALLY MAP THE PERFORMANCE OF PROTOTYPICAL CYLINDRICAL VHTT CONVERTERS BASED ON THAT TECHNOLOGY, TO ESTIMATE THE OPTIMUM CHARACTERISTICS OF CREDIBLE BURST AND ALERT POWER FOR SUBSEQUENT FISSION-HEATED VHTT CONVERTER TESTS IN PHASE III. VHTT IS A REAL AND IMPRESSIVE TECHNOLOGY FOR SUPERIOR SPACE NUCLEAR POWER SYSTEMS -- PHASE II WILL MAKE IT A U.S. TECHNOLOGY.

REKENTHALER TECHNOLOGY ASSOCS CORP AF
3400 JENNINGS CHAPEL RD
WOODBINE, MD 21797
CONTRACT NUMBER:
TIMOTHY A ZIMMERLIN
TITLE:
SAR-BASED SRT DISCRIMINATION
TOPIC# 223 OFFICE: BMO/MYSC

SUBMITTED BY DEPT

IN THIS PHASE II SBIR CONTRACT, THE ANALYTICAL STRUCTURE AND IMAGE PROCESSING PIPELINE DEVELOPED UNDER PHASE I WILL BE EXPLOITED FOR SAR-BASED SRT DISCRIMINATION. THREE PRIMARY TASKS ARE ADDRESSED. FIRST, A VARIETY OF STANDARD AND DEVELOPMENTAL PROCESSING ALGORITHMS WILL BE EVALUATED USING SEVERAL TEST DATA SETS. SECOND, AN OPTIMAL PROCESSING ALGORITHM, MODEL-BASED, AND USING A UNIQUE MEDIAL AXIS GENERATION TECHNOLOGY, IS TO BE DEVELOPED AND DEMONSTRATED. THIRD, THE SYNERGISTIC APPLICATION OF A VHSIC FOCAL PLANE PROCESSING CHIP WILL BE DEMONSTRATED, IN CONCERT WITH THE MEDIAL AXIS SOFTWARE. THE HARDWARE/SOFTWARE COMBINATION RESULTS IN AN "ADATIVE SENSOR-PROCESSOR" IDEALLY SUITED TO FLEXIBLE, ONBOARD TARGET DETECTION AND CLASSIFICATION.

RIBBON TECHNOLOGY CORP AF
PO BOX 30758
GAHANNA, OH 43230
CONTRACT NUMBER: F33615-88-C-5411
THOMAS GASPAR
TITLE:
DIRECT CAST TITANIUM ALLOY STRIP
TOPIC# 158 OFFICE: AFWAL/ML

RIBBON TECHNOLOGY CORPORATION DEMONSTRATED THE FEASIBILITY OF DIRECT CASTING TITANIUM ALLOYS BY IT'S PROPRIETARY MELT OVERFLOW RAPID SOLIDIFICATION PROCESS. THE PHASE II PROJECT WILL BE DIRECTED TOWARD CASTING TITANIUM ALLOY STRIP 30cm (12 IN) WIDE AND AS THIN AS 0.125mm (0.005 IN.). THE EFFECT OF MELT OVERFLOW PROCESS VARIABLES ON THE DIMENSIONS OF THE CAST STRIP WILL BE SYSTEMATICALLY INVESTIGATED. THE FIRST TASK WILL BE TO IDENTIFY DIFFERENT SUBSTRATE MATERIALS FOR CASTING TITANIUM ALLOYS. THE CASING SYSTEM WILL BE PHYSICALLY MODELED IN AIR AND MODIFICATIONS WILL BE MADE TO THE CASTER USED DURING THE PHASE I PROJECT. TWENTY FOUR EXPERIMENTS ARE PLANNED FOR USE WITH THE INDUCTION SKULL FURNACE OPERATED BY DURIRON COMPANY IN DAYTON, OHIO. THE DIRECT CAST STRIP WILL BE EVALUATED AT THE OHIO STATE UNIVERSITY AND AT THE UNIVERSITY OF ILLINOIS.

ROBOCOM SYSTEMS INC NAVY
3601 HEMPSTEAD TURNPIKE
LEVITTOWN, NY 11756
CONTRACT NUMBER:
HERB GOLDMAN
TITLE:
WAREHOUSE MECHANIZATION OF A NON-MECHANIZED AREA
TOPIC# 67 OFFICE: NAVSUP

SUBMITTED BY DEPT

THE TECHNICAL OBJECTIVE IS TO PROVIDE A MECHANIZED SYSTEM RATHER THAN EXISTING MANUAL OPERATION IN THE NON-MECHANIZED BUILDINGS AND OUTDOOR AREAS OF NISTARS FACILITIES. THE PHASE I PROGRAM DETERMINED THAT THIS CAN BE ACCOMPLISHED THROUGH THE USE OF A RADIO FREQUENCY (RF) DATA TERMINAL SYSTEM WHICH IS ESSENTIALLY 'PAPERLESS'. SUCH A SYSTEM PROVIDES 'ON-LINE' INFORMATION AND DATA BASE UPDATES, INCREASES CONTROL, AND ELIMINATES THOSE ERRORS INHERENT WITH MANUAL HANDLING OF MATERIAL. ADDITIONALLY, THIS SYSTEM SHOULD BE ESTABLISHED WITHOUT MODIFICATIONS TO THE EXISTING NISTARS OR UADPS SOFTWARE TO MINIMIZE IMPACT ON THE NAVY'S SUPPLY SYSTEM. THE PROPOSED PHASE II PORTION OF THIS PROJECT WILL DEVELOP THE NECESSARY SOFTWARE AND RF TERMINAL HARDWARE CONFIGURATIONS AT A REPRESENTATIVE SITE TO ENABLE FUTURE INTRODUCTION OF THIS CONCEPT TO ALL LIKE FACILITIES.

S.E.E.S. INC NAVY
11020 SOLWAY SCHOOL RD
KNOXVILLE, TN 37931
CONTRACT NUMBER:
R L ANDREWS
TITLE:
MOBILE ROBOT AND COMPUTER INTEGRATED PRINTING (MRCIP)
TOPIC# 74 OFFICE: NAVSUP

THIS PROPOSAL DESCRIBES METHODS TO AUTOMATE THE PRINTING INDUSTRY THROUGH THE DEVELOPMENT OF A SEMI-AUTONOMOUS MOBILE ROBOT AND DUAL PURPOSE END EFFECTOR. THE PROTOTYPE MODILE ROBOT WILL CONSIST OF A SELF-PROPELLED PLATFORM WITH A FORK LIFT MECHANISM AND A FULLY ARTICULATE ROBOTIC ARM. AN OFF ROBOT "HOMING SENSOR" AND SEARCHING ROUTINES PROVIDES ACCURACY NECESSARY TO GREATLY REDUCE ERROR. TO SHOW THE FLEXIBILITY AND COST EFFECTIVENESS OF THE MOBILE ROBOT AS THE CENTRAL UNIT IN THE AUTOMATION PLAN, A DEMONSTRATION WITH THE UNIT REMOVING PAPER FROM A MULTIGRAPHICS COLLATOR, STACKING THE PAPER, MOVING THE STACK, MEASURING AND CUTTING THE PADDED STACK, AND MOVING RAW MATERIAL ON A PALLET TO A MULTIGRAPHICS PRESS IS PROPOSED.

SACH SINHA & ASSOCS INC AF
PO BOX 11205
BURBANK, CA 91510
CONTRACT NUMBER:
SACH SINHA
TITLE:
KINETIC WEAPON BURST CONTROL FUZING SYSTEM
TOPIC# 191 OFFICE: BMO/MYSC

SUBMITTED BY DEPT

THIS IS THE SECOND PHASE OF THE PROGRAM FOR DESIGN AND DEVELOPMENT OF A FUZING SYSTEM WHICH CAN ACCURATELY DETERMINE THE DEPTH OF PENETRATION OF A KINETICALLY DELIVERED WARHEAD OVER A TARGET AT A VARIETY OF IMPACT ANGLES AND BALLISTIC IMPACT. IT IS TARGET PROGRAMMED BEFORE LAUNCH AND IT CONTROLS THE WARHEAD BURST POINT AS A FUNCTION OF A PREPROGRAMMED AND TARGET ENVIRONMENTAL INPUTS. THE EFFORT ALSO ESTABLISHES A METHOD TO IGNITE SECONDARY EXPLOSIVES BY MEANS OF LASER USING LASER IDODE AS A SOURCE. DURING THIS PHASE (PHASE II), FUZING SYSTEM IS DESIGNED, FABRICATED AND TESTED AGAINST TARGETS SUCH AS CONCRETE AND MULTILAYER TARGETS CONSISTING OF CONCRETE SLABS SEPARATED BY A CAVITY. A LASER IGNITION SYSTEM IS IDENTIFIED AND TESTED. FINALLY, A PROGRAMMABLE IN-LINE FUZING USING LASER INITIATION IS DESIGNED, FABRICATED AND TESTED FOR IGNITION PERFORMANCE. IF THE PERFORMANCE OF LASER SYSTEM IS INADEQUATE, SLAPPER DETONATOR WILL BE USED FOR IGNITION.

SAN DIEGO SEMICONDUCTORS INC AF
9030 CARROLL WAY - UNIT 8
SAN DIEGO, CA 92121
CONTRACT NUMBER: F33615-87-C-5320
DR EMMANUIL RAISKIN
TITLE:
LARGE VOLUME SUBSTRATE QUALITY CRYSTAL OF CdSeTe AND CdZnTe USING A NEW CRYSTAL GROWTH PROCESS
TOPIC# 151 OFFICE: AFWAL/ML

SINGLE CRYSTALS OF CdTe TYPE MATERIALS WITH DIMENSIONS IN EXCESS OF 4 INCHES DIAMETER AND 5 INCHES LENGTH WILL BE GROWN BY A NEW PROCESS EMPLOYING A MODIFIED VERTICAL BRIDGMAN TECHNIQUE IN A QUARTZ-FREE, HIGH PRESSURE SYSTEM WHOSE FEASIBILITY WAS DEMONSTRATED IN PHASE I. CRYSTAL OF CdSeTe AND CdZnTe WILL BE GROWN AND THEIR CHARACTERISTICS COMPARED WITH RESPECT TO MEASURES OF STRUCTURAL QUALITY AND COMPOSITIONAL HOMOGENEITY. RESULTS OF HOMOGENEITY STUDIES WILL BE COMPARED WITH A QUALITATIVE THEORY ESTABLISHED IN PHASE I IN ORDER TO FURTHER DEVELOP THIS THEORY; IMPROVED UNDERSTANDING IN THIS AREA WOULD BE OF MAJOR IMPORTANCE TO THIS AND OTHER MATERIALS PROGRAMS. SUCCESSFUL CONCLUSION OF THE PROGRAM WILL 1) RESULT IN A CAPABILITY FOR PRODUCING SUBSTRATES WITH HIGH PURITY, EXCELLENT CRYSTAL MORPHOLOGY, AND AREAS OF UP TO 70 cm(2), 2) PROVIDE NEW UNDERSTANDING ABOUT LATTICE HARDENING AND COMPOSITIONAL HOMOGENEITY

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IN CdTe TYPE CRYSTALS AND 3) ALLOW A DEFINITIVE COMPARISON TO BE MADE BETWEEN CdTeSe AND CdZnTe.

SAN DIEGO SEMICONDUCTORS INC ARMY
9030 CARROLL WY - STE 8
SAN DIEGO, CA 92121
CONTRACT NUMBER:
DR EMMANUIL RAISKIN
TITLE:
GROWTH AND INVESTIGATION OF 3-INCH DIAMETER 3-KILOGRAM CRYSTALS OF CdZnTe
TOPIC# 65 OFFICE: CECOM/NV

THE MAIN OVERALL OBJECTIVE IS TO DEVELOP A CAPABILITY FOR GROWING 3.0-in (7.6-cm) DIAMETER, 3-Kg CRYSTALS OF CdZnTe SUITABLE FOR USE AS SUBSTRATES FOR HIGH PERFORMANCE HgCdTe DETECTOR ARRAYS. CRYSTAL GROWTH WILL UTILIZE A NEW HIGH PRESSURE VERTICAL BRIDGMAN METHOD, IN WHICH THE ELIMINATION OF QUARTZ, AN IMPROVED TEMPERATURE PROFILE AND OTHER FACTORS GIVE ADVANTAGES OVER OTHER METHODS. THE PROGRAM WILL INCLUDE ANALYSIS AND MODELLING, THE USE OF SEEDED GROWTH TO ACHIEVE PREDETERMINED ORIENTATION, AND INVESTIGATIONS INTO IMPROVING COMPOSITIONAL HOMOGENEITY. THE PROGRAM WILL CONCENTRATE ON A COMPOSITION OF 4 at% Zn, ALTHOUGH AT LEAST ONE CRYSTAL OF 20 at% Zn WILL BE GROWN AS PART OF THE HOMOGENEITY INVESTIGATION. CRYSTALS AND WAFERS WILL BE CHARACTERIZED BY AN ADVANCED METHOD BASED ON USING SYNCHROTRON X-RAYS, IN ADDITION TO STANDARD METHODS SUCH AS EFD COUNTS, IR ANALYSIS AND COMPOSITIONAL ANALYSIS.

SAN DIEGO SEMICONDUCTORS INC ARMY
9030 CARROLL WY - STE 8
SAN DIEGO, CA 92121
CONTRACT NUMBER:
DR EMMANUIL RAISKIN
TITLE:
IMPROVED PERFORMANCE CdTe NUCLEAR RADIATION MONITORS
TOPIC# 72 OFFICE: CECOM/EW

THE OVERALL GOAL IS TO DEVELOP THE CAPABILITY FOR PRODUCING CdTe GAMMA RAY DETECTORS SUITABLE FOR USE IN A LOW COST POCKET DOSIMETER

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CAPABLE OF MEASURING BACKGROUND RADIATION LEVELS AT PHOTON ENERGIES AS LOW AS 80 KeV IN A FIELD ENVIRONMENT. SPECIFIC OBJECTIVES INCLUDE A DETECTOR BIAS OF 10 VOLTS OR LESS AND PRODUCTION COST LOW ENOUGH TO SUPPORT A DETECTOR PRICE OF $50.00 OR LESS. THE DETECTOR TECHNOLOGY WILL BE BASED ON USING THE COMPANY'S NEW HIGH PRESSURE VERTICAL BRIDGMAN APPROACH TO CRYSTAL GROWTH TO PRODUCE 7.5-cm DIAMETER, 10-cm LONG CdTe CRYSTALS. A MAJOR PORTION OF THE PROGRAM WILL BE DEVOTED TO OPTIMIZING THE GROWTH PROCESS. LARGE-VOLUME CRYSTALS SHOULD MAKE IT FEASIBLE TO EMPLOY THE COST REDUCING MANUFACTURING METHODS NEEDED FOR A $50.00 UNIT PRICE. THE PROGRAM WILL ALSO INCLUDE ATTENTION TO IMPROVING METALLIZATION AND BONDING METHODS, DEVELOPING A SHOCK AND VIBRATION ISOLATED DETECTOR HOUSING ASSEMBLY AND DELIVERY OF A PROTOTYPE DOSIMETER.

SAT-CON TECHNOLOGY CORP SDIO
71 ROGER ST
CAMBRIDGE, MA 02142
CONTRACT NUMBER:
BRUCE G JOHNSON
TITLE:
ACTIVE MAGNETIC VIBRATION ISOLATION
TOPIC# 1 OFFICE:

MANY PRECISION POINTING AND TRACKING SYSTEMS OPERATE IN VIBRATION ENVIRONMENTS THAT REQUIRE VIBRATION ISOLATION TO ACHIEVE DESIRED PERFORMANCE. ACTIVE VIBRATION ISOLATION SYSTEMS UTILIZING HIGH-FORCE CAPABILITY, NONLINEAR MAGNETIC ACTUATORS ARE A PROMISING MEANS OF ACHIEVING THE REQUIRED HIGH LEVELS OF VIBRATION ISOLATION, ALTHOUGH PERFORMANCE HAS BEEN LIMITED TO DATE DUE TO CONVENTIONAL CONTROL ALGORITHMS. TO ADDRESS THIS ISSUE, THE RESEARCH EFFORTS OF A PREVIOUS PHASE DEVELOPED ADVANCED, SLIDING MODE CONTROL ALGORITHMS TO THIS HIGHLY NONLINEAR SYSTEM FOR A SINGLE-DEGREE-OF-FREEDOM VIBRATION ISOLATION APPLICATION. THE USE OF FIELD SHAPING OF THE ELECTROMAGNETIC ACTUATORS WAS INVESTIGATED. UNDER THE CURRENT RESEARCH EFFORT, THE PROMISING ANALYTICAL RESULTS PREVIOUSLY DEVELOPED ARE BEING EXPERIMENTALLY VALIDATED AND THE SLIDING MODE CONTROL EXTENDED TO A MULTI-DEGREE-OF-FREEDOM VIBRATION ISOLATION ENVIRONMENT A THREE-DEGREE-OF-FREEDOM ISOLATION SYSTEM UTILIZING HIGH-FORCE CAPABILITY ELECTROMAGNETIC IS BEING DESIGNED, CONSTRUCTED, AND TESTED. THIS TEST BED IS ALLOWING DEMONSTRATION OF THE USEFULNESS OF SLIDING MODE

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CONTROL IN CONJUNCTION WITH SPECIALLY DESIGNED ELECTROMAGNETS TO PROVIDE VIBRATION ISOLATION FROM BASE PLANE MOTION AND DISTURBANCE FORCES ACTING DIRECTLY ON THE SUSPENDED BODY DURING BOTH SLEW AND QUIESCENT PERIODS.

SCHWARTZ ELECTRO-OPTICS INC AF
45 WINTHROP ST
CONCORD, MA 01742
CONTRACT NUMBER: FQ8671-8601173
DR PETER F MOULTON
TITLE:
CHROMINUM-SENSITIZED GARNETS OF MID-IR LASERS
TOPIC# 13 OFFICE: AFOSR/XOT

IN THIS PHASE II PROPOSAL WE WOULD EXTEND THE PHASE I EFFORT, WHICH EXAMINED THE Er:Cr:YSGG 2.8-um LASER, TO INCLUDE A STUDY OF 1.6-um Er(3+) LASERS AND LASERS BASED ON TRANSITIONS OF THE Ho(3+) AND Tm(3+). TECHNCAL OBJECTIVES INCLUDE: 1) THE SUPPORT OF A SUSTAINED SUBCONTRACTED EFFORT ON THE CRYSTAL GROWTH OF MULTIPLY-DOPED LARGE-LATTICE GARNETS, 2) THE PERFORMANCE OF SPECTROSCOPIC MEASUREMENTS THE MATERIALS, 3) A DETERMINATION, FOR EACH OF THE CRYSTALS, OF THE ENERGY LEVELS OF THE RARE-EARTH IONS AND OF THE INTERACTION PARAMETER BETWEEN IONS INVOLVED IN THE TRANSFER PROCESS, 4) AN ATTEMPT TO OBTAIN LASER OPERATION UNDER FLASHLAMP PUMPING FROM EACH MATERIAL AND 5) AN EVALUATION OF THE SUITABILITY FOR COMMERCIAL DEVELOPMENT OF THE MATERIALS IN ANY FOLLOW-ON EFFORTS.

SCIENCE & ENGINEERING ASSOCS INC AF
PO BOX 3722
ALBUQUERQUE, NM 87109
CONTRACT NUMBER:
JAMES A KELLER
TITLE:
GROUND MOBILE TARGET DISCRIMINATION
TOPIC# 224 OFFICE: BMO/MYSC

DIFFERENT PHASES OF CONFLICT PRESENT RADICALLY DIFFERENT ENVIRONMENTS AND OPERATING CONSTRAINTS TO SENSING SYSTEMS DESIGNED TO LOCATE GROUND MOBILE TARGETS. SUCH SYSTEMS ARE THE PRIMARY MEANS OF INFOR-

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MATION TO HOLD RELOCATABLE TARGETS AT RISK, AS REQUIRED BY NATIONAL SECURITY COUNCIL DIRECTIVES. EXPANDING UPON A SIGNATURE AND SENSOR SCREENING AND ENVIRONMENT DEFINITION ASSOCIATED WITH CONFLICT PHASES FROM PHASE I, SEA WILL PURSUE THE FOLLOWING PHASE II OBJECTIVES: 1) DEVELOP QUANTITATIVE DEFINITIONS OF THE NATURAL, MAN-MADE, AND WEAPON-INDUCED ENVIRONMENTS WITHIN WHICH SENSOR PORTIONS OF A COUNTER-RT SYSTEM MUST OPERATE; 2) PROVIDE THE INITIAL FRAMEWORK OF A SYSTEM REQUIREMENTS DOCUMENT, DEALING WITH THE ENVIRONMENTAL AND SENSOR PERFORMANCE AND OPERATIONAL PARAMETERS AND 3) IDENTIFY AREAS OF LIMITED UNDERSTANDING OR TECHNOLOGY SHORTFALLS WHERE ADDITIONAL SPECIFIC RESEARCH OR DEVELOPMENT WOULD YIELD HIGH PAYOFF. FOUR SIGNATURES (OPTICAL/VISUAL, C(3), RADAR, AND IR/THERMAL) CONSIDERED VIABLE FOR HIGH ALTITUDE SEARCH WILL BE STUDIES TO ARRIVE AT SENSOR PLATFORM AND OPERATIONAL REQUIREMENTS. IN ADDITION, IMPLANTS AND OTHER SENSORS DEPLOYED IN THE TARGET LOCALE WILL BE SCREENED FOR VALUE IN EXPLOITING SIGNATURES AND ASSISTANCE TO ICBM RELATED SCENARIOS.

SCIENCE RESEARCH LAB DARPA
15 WARD ST
SOMERVILLE, MA 02143
CONTRACT NUMBER:
JONAH JACOB
TITLE:
NEW DISCHARGE PUMPING METHOD FOR CO2 LASERS
TOPIC# 21 OFFICE: DARPA

A NEW PULSED LASER DISCHARGE CONCEPT IS PROPOSED TO MEET MILITARY AND CIVILIAN REQUIREMENTS FOR EFFICIENT OPERATION OF COMPACT, HIGH ENERGY CO2 LASERS. THIS DISCHARGE CONCEPT PROMISES PULSE LENGTHS OF UP TO 100 MICROSECOND DURATION, SCALABILITY TO MULTI-KILOJOULE SINGLE PULSED ENERGY, HIGH VOLUMETRIC EFFICIENCY (> OR - JOULES/LITER-ATM), ATMOSPHERIC PRESSURE OPERATION AND HIGH ELECTRICAL EFFICIENCY (> OR - 20%). THIS LASER DISCHARGE CONCEPT RELIES ON A NEW METHOD FOR MAINTAINING DISCHARGE STABILITY FOR LONG PULSE DURATIONS WHICH PROMISES INCREASED EFFICIENCY, REPETITION RATE, LASER PULSE LENGTH, EXTRACTED ENERGY PER UNIT VOLUME AND RELIABILITY. THE OBJECTIVE OF THE PHASE II EFFORT IS TO VERIFY THE NEW CO2 LASER DISCHARGE CONCEPT EXPERIMENTALLY. THIS CO2 LASER DISCHARGE CONCEPT WAS EXTENSIVELY MODELLED IN THE PHASE I EFFORT AND A CONCEPTUAL DESIGN OF AN EFFICIENT PULSED CO2 LASER BASED ON THIS NEW EXCITATION CONCEPT WAS DEVELOPED. THE

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PHASE II EFFORT WILL FOCUS ON THE FABRICATION AND TEST OF THE PULSED CO2 LASER DESIGNED IN PHASE I. CO2 LASER TESTING WILL BE PROVIDED TO EXPLORE THE LIMITS OF PULSED LASER PERFORMANCE USING THIS NEW EXCITATION METHOD. IN ADDITION, DISCHARGE PERFORMANCE WILL BE DIAGNOSED AND COMPARED WITH DISCHARGE MODEL PREDICTIONS DEVELOPED IN PHASE I OVER A BROAD RANGE OF OPERATING CONDITIONS ENCOMPASSING THOSE REQUIRED FOR ANTI-SENSOR AND LASER RADAR APPLICATIONS.

SCIENTIFIC RESEARCH ASSOCS INC NAVY
PO BOX 1058 - 50 NYE RD
GLASTONBURY, CT 06033
CONTRACT NUMBER:
DR BRIAN E THOMPSON
TITLE:
ADVANCED GAS TURBINE AUGMENTOR ACOUSTIC CHARACTERIZATION
TOPIC# 177 OFFICE: NAPC/NAVAIR

COMBUSTION INSTABILITIES ARE ASSOCIATED WITH ACOUSTIC RESONANCE AND THEY CAN CREATE PROBLEMS WITH THE OPERATION AND DURABILITY OF HIGH PERFORMANCE GAS-TURBINE AUGMENTORS. THE PROPOSED PROGRAMS WOULD PROVIDE UNDERSTANDING AND METHODS THAT WOULD BE USEFUL IN THE ANALYSIS AND DESIGN OF PRESENT AND FUTURE AUGMENTORS. UNDER THE PHASE I EFFORT, SCALED AUGMENTOR CONFIGURATIONS WERE EXPERIMENTALLY INVESTIGATED FOR INSTABILITIES WITH PREMIXED TURBULENT COMBUSTION FOR A RANGE OF GEOMETRIES, BULK-MEAN VELOCITIES AND EQUIVALENCE RATIOS. ROUGH COMBUSTION WAS OBSERVED TO HAVE A DOMINANT FREQUENCY ASSOCIATED WITH ACOUSTIC FREQUENCIES AND WAS FOUND TO DEPEND ON INFLOW VELOCITY, BY-PASS FLOW AND NOZZLE CONSTRICTION. THE RESULTS SUGGEST THAT IT IS FEASIBLE TO SIMULATE RUMBLE IN AUGMENTORS EXPERIMENTALLY, AND TO DEVELOP AN ADVANCED COMPUTATIONAL PROCEDURE FOR AUGMENTOR PURPOSES. UNDER THE PROPOSED PHASE II PROGRAM, AN INTERACTION OF EXPERIMENTAL AND COMPUTATIONAL EFFORTS WOULD DEVELOP A VALIDATED FLOW SIMULATION MODEL FOR AUGMENTORS, INNOVATIONS IN SCREEN AND TUMBLE CONTROL, ASSOCIATED SURVIVALBE FEATURES AND A REPRESENTATION OF SCREECH IN SCALED-DOWN EXPERIMENTS. THE DEPENDENCE OF COMBUSTION OSCILLATIONS ON A COMBINATION OF FUELING ARRANGEMENT, SWIRL AND GEOMETRY WOULD BE INVESTIGATED. THE EXPERIMENTS WOULD HAVE INTRINSIC VALUE AND WOULD INCLUDE ADDITIONAL MEASUREMENTS TO SUPPORT THE COMPUTATIONAL-MODELING EFFORT.

SCIENTIFIC RESEARCH ASSOCS INC AF
PO BOX 1058 - 50 NYE RD
GLASTONBURY, CT 06033
CONTRACT NUMBER: F33615-87-C-5323
YUK-TONG CHAN
TITLE:
NUMERICAL SIMULATION OF MAGNETIC LEC GROWTH OF GaAs
TOPIC# 152 OFFICE: AFWAL/ML

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THIS DOCUMENT DESCRIBES A PROPOSED PHASE II SBIR PROGRAM FOR PERFORMING NUMERICAL STUDIES WITH REALISTIC PARAMETERS, OF LIQUID ENCAPSULATED CZOCHRALSKI (LEC) GaAs CRYSTAL GROWTH. THE PROPOSED PROGRAM HAS THREE BROAD OBJECTIVES: i) CONTINUE DEVELOPMENT OF A ROBUST 3-D TRANSIENT ALGORITHM TO UNDERSTAND THE PHYSICS OF HEAT TRANSFER, AND HYDRODYNAMIC CHARACTERISTICS OF THE LEC GROWTH SYSTEM IN THE PRESENCE AND ABSENCE OF A MAGNETIC FIELD, ii) INCORPORATE AND TEST EFFECTS OF DETAILED GROWTH ELEMENTS ON GaAs GROWTH, iii) PROVIDE OPTIMUM GROWTH CONDITIONS FOR REPRODUCIBLE GROWTH OF LARGE-DIAMETER, HIGH-QUALITY GaAs SINGLE CRYSTALS. THE EQUATIONS TO BE SOLVED IN THIS STUDY INCLUDE: i) CONSERVATION EQUATIONS FOR THE MASS, MOMENTUM AND ENERGY, SPECIES AND MAGNETIC INDUCTION EQUATION IN THE MELT PHASE, ii) ENERGY BALANCE AND THERMAL STRESS EQUATIONS IN THE CRYSTAL, iii) CONSERVATION FOR THE MASS, MOMENTUM AND ENERGY IN THE LIQUID ENCAPSULANT, iv) HEAT CONDUCTION EQUATIONS IN THE CRUCIBLE SUSCEPTOR AND PBN LAYERS. IN ADDITION, THE SHAPES OF THE MELT-CRYSTAL, MELT-LIQUID AND LIQUID-GAS INTERFACES, AND CRYSTAL-GAS SURFACE WILL ALSO BE DETERMINED ALONG WITH THE SOLUTIONS. NUMERICAL SIMULATIONS WILL ALSO INCLUDE THE VOLUME CHANGE OF THE MELT PHASE, AND NONUNIFORM GROWTH (CRYSTAL DIAMETER VARIATIONS).

SCIENTIFIC RESEARCH ASSOCS INC ARMY
PO BOX 1058 - 50 NYE RD
GLASTONBURY, CT 06033
CONTRACT NUMBER:
DR HOWARD J GIBELING
TITLE:
PROJECTIVE BASE BLEED TECHNOLOGY
TOPIC# 151 OFFICE: LABCOM/BRL

THE PROPOSED EFFORT WOULD DEVELOP A PREDICTIVE TECHNIQUE FOR THE PROJECTILE BASE FLOW REGION INCLUDING THE EFFECTS OF BASE INJECTION AND SPIN. THE TECHNIQUE WOULD BE BASED UPON A SOLUTION OF THE NAVIER-STOKES EQUATIONS WITHOUT THE ASSUMPTION OF AXIAL SYMMETRY, AND WOULD BE APPLICABLE FROM THE LOW SUBSONIC MACH NUMBER RANGE THROUGH THE MIS-SUPERSONIC RANGE FOR FLOW ABOUT BOTH AXISYMMETRIC AND NON-AXISYMMETRIC BODIES. AT PRESENT MOST TECHNIQUES FOR PREDICTING THE PROJECTILE BASE BLEED FLOW FIELDS ARE BASED UPON RELATIVELY SIMPLE EMPIRICAL ANALYSES OR ARE RESTRICTED TO ASSUMED AXISYMMETRIC FLOW. THE APPROACH PROPOSED HEREIN WOULD BE AN INNO-

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VATIVE TECHNIQUE BASED UPON A HIGH RESOLUTION NAVIER-STOKES STUDY WHICH WOULD INCLUDE TWO PHASE BASE INJECTION AND, THEREFORE, WOULD SIMULATE THE PHYSICS FROM THE GOVERNING EQUATIONS.

SCIENTIFIC RESEARCH ASSOCS INC ARMY
PO BOX 1058 - 50 NYE RD
GLASTONBURY, CT 06033
CONTRACT NUMBER:
BERNARD C WEINBERG
TITLE:
DEVELOPMENT OF A MULTIFREQUENCY JET VENTILATOR FOR USE UNDER BATTLEFIELD CONDITIONS
TOPIC# 214 OFFICE: MEDICAL

THE PRIMARY OBJECTIVE OF THE PHASE II EFFORT IS TO EXPAND THE STUDIES OF PENETRATING CHEST INJURIES BEGUN UNDER PHASE I WITH THE AIM OF DELIVERING A PORTABLE ULTRA-HIGH FREQUENCY JET VENTILATOR TO THE ARMY THAT COULD BE USED UNDER BATTLEFIELD CONDITIONS. BOTH EXPERIMENTAL AND ENGINEERING STUDIES WOULD BE PERFORMED. IN THE EXPERIMENTAL PROGRAM, CONTROLLED ANIMAL EXPERIMENTS WOULD BE CONDUCTED TO INVESTIGATE THE PHYSIOLOGICAL INDICATIONS ASSOCIATED WITH A PENETRATING CHEST WOUND. THE ENGINEERING PORTION OF THE RESEARCH EFFORT WOULD FOCUS UPON THE METHODOLOGIES REQUIRED FOR IMPLEMENTING THE JET VENTILATOR ON THE BATTLEFIELD. SUBSEQUENTLY, THE JET VENTILATOR, AFTER OBTAINING FDA APPROVAL FOR AN INDICATION OF CHEST TRAUMA, WOULD UNDERGO HUMAN TRIALS IN THE CIVILIAN AND MILITARY SECTORS.

SCOPE INC ARMY
1860 MICHAEL FARADAY DR
RESTON, VA 22090
CONTRACT NUMBER:
DR JOHN F GREEN
TITLE:
A DIGITAL SYSTEM APPROACH FOR REALTIME HF EMITTER IDENTIFICATION
TOPIC# 56 OFFICE: CECOM/AMSEL

SCOPE PROPOSES TO CONTINUE DEVELOPMENT, IN PHASE II, OF A DIGITAL SIGNAL PROCESSING CONCEPT FOR THE REAL TIME DETECTION, SORTING, AND

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IDENTIFICATION OF HF EMITTER AND THEIR PLATFORMS. THIS PHASE II INVESTIGATION WILL ANALYZE FIELD-COLLECTED HF SIGNALS OF INTEREST TO VERIFY AND ASSESS RESULTS OF THE PHASE I WORK. A LABORATORY DIGITAL SIGNAL PROCESSING TESTBED WILL BE DEVELOPED IN PHASE II TO ASSIST IN THE QUANTITATIVE EVALUATION OF VARIOUS SYSTEM CONCEPT CONFIGURATION AND COMPUTATION ISSUES. RESULTS OF THIS PROPOSED WORK WILL INCLUDE RECOMMENDED SIGNAL PROCESSING PROCEDURES, IDENTIFICATION PERFORMANCE PARTICULARS, AND PREFERRED SYSTEM CONFIGURATIONS. SYSTEM SPECIFICATIONS WILL ALSO BE ESTBLISHED.

SCOPE INC NAVY
1860 MICHAEL FARADAY DR
RESTON, VA 22090
CONTRACT NUMBER:
DR JOHN F GREEN
TITLE:
A PASSIVE RF SEEKER AUTOMATIC SHIP TARGET IDENTIFIER AND CLASSIFIER FOR CRUISE MISSILES DEVELOPMENT
TOPIC# 173 OFFICE: JCM/NSWC-DL

THIS EFFORT IS DIRECTED TOWARDS DEVELOPING A RF SEEKER SIGNAL PROCESSING TECHNOLOGY TO PASSIVELY IDENTIFY AND CLASSIFY SHIP TARGETS FOR CRUISE MISSILES. THE TECHNOLOGY, AN ADAPTATION OF REAL TIME OF RF EMITTER IDENTIFICATION SYSTEMS PREVIOUSLY DEVELOPED BY SCOPE, RELIES ON THE PASSIVE EXPLOITATION OF UNINTENTIONAL CHARACTERISTICS IMPOSED ON RF SIGNALS. THE PHASE I EFFORT RESULTED IN A PRELIMINARY SYSTEM DESIGN AND DESCRIPTIONS OF CRITICAL SIGNAL PROCESSING ALGORITHMS. THIS PHASE II EFFORT WILL PROVIDE THE DESIGN, ASSEMBLY, INSTALLATION, AND FIELD OPERATIONS OF A HIGH SPEED, DIGITAL RADAR COLLECTION SYSTEM FOR PASSIVE TARGET IDENTIFICATION AND CLASSIFICATION.

SEA TECH INC NAVY
PO BOX 779
CORVALLIS, OR 97339
CONTRACT NUMBER:
ROBERT BARTZ
TITLE:
AN OPTICAL FEEDBACK BASED HIGH ACCURACY BEAM TRANSMISSOMETER DEVELOPMENT
TOPIC# 11 OFFICE: ONR

SUBMITTED BY DEPT

DEVELOP AND TEST A SHORT-WAVELENGTH, LIGHT-EMITTING-DIODE BEAM TRANSMISOMETER FOR UNDERWATER DEPLOYMENT USING THE OPTICAL FEEDBACK LOOP TECHNOLOGY DEVELOPED UNDER PHASE I OF THIS SBIR EFFORT.

SECURITY VENTURES CORP DARPA
25 BLACK LATCH LN
CHERRY HILL, NJ 08003
CONTRACT NUMBER:
DR DAVID SHEBY
TITLE:
PARALLEL COMPUTING ARCHITECTURES FOR BISPECTRAL ANALYSIS FOR NEW DOD SURVIELLANCE SYSTEMS
TOPIC# 17 OFFICE: DARPA

GENERIC DISCRIMINANTS AND ALGORITHMS BASED ON NONLINEAR MULTISPECTRAL ANALYSIS OFFER THE POTENTIAL FOR A NEW GENERATION OF MORE POWERFUL SURVEILLANCE SYSTEMS. THE ACTUAL COMPUTATION OF THESE GENERIC DISCRIMINANTS IN THE CONTEXT OF ACTUAL APPLICATIONS (I.E., HIGH DATA-RATE THROUGHPUT, REAL-TIME COMPUTATION, TIME-VARYING CONDITIONS OF SIGNAL TRANSMISSION, ETC.) MAKES IT IMPERATIVE THAT VERY HIGH-SPEED COMPUTATIONAL MEANS BE AVAILABLE. THIS PHASE II PROPOSAL DESCRIBES A PROJECT THAT WILL EMBED THESE MILTISPECTRAL DISCRIMINANTS, DEVELOPED IN PHASE I, INTO DARPA PROGRAM SUPER-PARALLEL COMPUTING ARCHITECTURE FOR THE PURPOSE OF: a) DEFINING AND IMPLEMENTING THE OPTIMAL PARALLEL ARCHITECTURE FOR A DEDICATED SYSTOLIC PROCESSOR TO PROVIDE THE FINAL HOST ENVIRONMENT FOR THE ALGORITHMS FOR FIELD DEPLOYMENT WITHIN THE SURVEILLANCE COMMUNITY; AND b) TESTING THE PROPOSED MULTISPECTRAL ALGORITHMS WITH REAL DATA PROVIDED BY THE SPONSOR.

SIG-PRO SYSTEMS INC NAVY
PO BOX 4452 - 1121 BALDWIN ST - STE B
SALINAS, CA 93912
CONTRACT NUMBER:
DR LONNIE A WILSON
TITLE:
RF SEEKER AUTOMATIC SHIP TARGET CLASSIFICATION
TOPIC# 173 OFFICE: JCM/NSWC-DL

SUBMITTED BY DEPT

CRUISE MISSILE RF SEEKER SYSTEMS WILL BE REQUIRED TO PERFORM SHIP TARGET CLASSIFICATION FOR HIGH-VALUED TARGET SELECTION AND CONSERVATION OF MISSILE RESOURCES. THE PHASE I EFFORT INVESTIGATED THE TECHNICAL FEASIBILITY OF ADDING TARGET CLASSIFICATION TO CRUISE MISSILE RF SEEKERS AND CONSIDERED RF SEEKER IMPROVEMENTS, NEW FEATURE EXTRACTION AND TARGET CLASSIFICATION PROCESSORS, AND ALSO FOURIER PHASE SPECTRUM CHARACTERISTICS. THE PHASE I EFFORT IDENTIFIED SOME MAJOR TECHNICAL ISSUES RELEVANT TO ADDING A NEW RF SEEKER AND AUTOMATIC TARGET RECOGNITION CAPABILITIES TO MISSILES. THIS PHASE II EFFORT IS DIRECTED TOWARDS THE PRELIMINARY SOLUTION OF CURRENT SHIP TARGET CLASSIFICATION TECHNICAL ISSUES IDENTIFIED IN THE PHASE I EFFORT.

SILICON DESIGNS INC SDIO
1445 NW MALL ST
ISSAQUAH, WA 98027
CONTRACT NUMBER:
JOHN C COLE
TITLE:
MINIATURE RADIATION HARD ACCELEROMETER FOR KINETIC ENERGY VEHICLE
TOPIC# 7 OFFICE:

SMALL KINETIC ENERGY VEHICLES NEED MINIATURE INERTIAL SENSORS CAPABLE OF ACCURATE OPERATION AFTER EXPOSURE TO HIGH LEVELS OF RADIATION. ONE APPROACH IS TO DEVELOP A MINIATURE MICROSENSOR ACCELERATOR THAT USES CAPACITANCE AS THE SENSING PARAMETER AND IS INSENSITIVE TO RADIATION. THE ACCELEROMETER APPROACH USES MINIATURE SENSE ELEMENTS EASILY FABRICATED DIRECTLY ON THE SURFACE OF A SILICON WAFER OF INTEGRATED CIRCUITS (IC) AND CONTAINS ALL THE CIRCUITRY NEEDED TO INTERFACE TO A MICROPROCESSOR FOR GUIDANCE AND NAVIGATION. UNDER THE PREVIOUS RESEARCH PHASE, ACCELERATOR REQUIREMENTS WERE ESTABLISHED; A RADIATION-HARD CUSTOM IC FOR THE ACCELEROMETER DESIGNED AND ITS PERFORMANCE ANALYZED IN A SEVERE RADIATION ENVIRONMENT. THE FEASIBILITY WAS DEMONSTRATED OF SUCH A RADIATION-HARD CIRCUIT IN CMOS-SOS. UNDER THE CURRENT RESEARCH EFFORT, THF CUSTOM IC IN CMOS-SOS IS BEING LAID OUT, RADIATION-HARD WAFER FABRICATED AT A SILICON FOUNDRY, PROTOTYPE ACCELEROMETERS BUILT, AND PERFORMANCE AND RADIATION TESTS CONDUCTED ON THE ACCELEROMETERS. THESE ANALOG TECHNIQUES, WHEN SUCCESSFULLY DEMONSTRATED, WOULD BE USEFUL IN CRITICAL STRATEGIC DEFENSE APPLICATIONS REQUIRING LOW-POWER, HIGH PERFORMANCE,

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RADIATION-HARD ANALOG CIRCUITS, SUCH AS SENSOR AMPLIFIERS, ANALOG FILTERS AND ANALOG-TO-DIGITAL CONVERTERS.

SIMULA INC AF
10016 S 51ST STREET
PHOENIX, AZ 85044
CONTRACT NUMBER:
R E ZIMMERMANN
TITLE:
DEVELOPMENT OF AN IMPROVED NECK FOR EJECTION SYSTEM TEST MANIKINS PHASE II FULL-SCALE DEVELOPMENT
TOPIC# 279 OFFICE: AMD/RDO

CURRENT TESTING MANIKINS HAVE BEEN DEVELOPED TO SIMULATE HUMAN RESPONSE IN AUTOMOTIVE ENVIRONMENTS FOCUSING ON FORWARD AND LATERAL IMPACTS. CONSEQUENTLY, COMPARATIVELY LITTLE DEVELOPMENTAL WORK HAD BEEN DONE TO IMPROVE THE BIOFIDELITY OF THE MANIKIN NECK FOR APPLICATION IN EJECTION SEAT TESTING. PHASE I OF THIS PROGRAM CONSISTED OF AN INVESTIGATION OF EXISTING NECK DESIGNS, A LITERATURE SEARCH, AND CALCULATIONS TO DETERMINE THE ENGINEERING PROPERTIES OF AN IMPROVED MANIKIN NECK, AND THEN DEVELOPING AND EVALUATING CONCEPTS TO MEET THESE REQUIREMENTS. THE RESULT OF THIS EFFORT WAS TWO CONCEPTS WHICH SHOULD PROVIDE IMPROVED BIOFIDELITY FOR APPLICATIONS IN EJECTION SEAT TESTING. THE OBJECTIVES OF THE PROPOSED PHASE II EFFORT ARE TO COMPLETE THE ENGINEERING DESIGN OF MANIKIN NECK AND THEN FABRICATE AN ADVANCED PROTOTYPE WHICH WOULD BE DYNAMICALLY TESTED AND IMPROVED UPON FOR MAXIMUM PERFORMANCE. THE PROGRAM PLAN INCLUDES DEVELOPMENT OF PERFORMANCE CRITERIA, MATERIAL SEARCH AND SELECTION, PROTOTYPE TESTING. OPTIONS FOR A COMPUTER MODEL OF THE NEW NECK DESIGN AND EXTENDED DYNAMIC TESTING ARE ALSO INCLUDED. THE ANTICIPATED RESULT OF THE PHASE II EFFORT IS A MANIKIN NECK STRUCTURE THAT IS ADAPTABLE TO EXISTING TEST MANIKINS AND WHICH WOULD PROVIDE IMPROVED BIOFIDELITY FOR EJECTION SEAT TESTING.

SIMULA INC ARMY
10016 S 51ST ST
PHOENIX, AZ 85044
CONTRACT NUMBER:
JOSEPH W COLTMAN
TITLE:
ENGINEERING ANALYSIS OF THE USE OF ADVANCED TOUGHENED COMPOSITES FOR U.S. ARMY AIRCRAFT PRIMARY STRUCTURES
TOPIC# 46 OFFICE: AVSCOM/AMSAV

SUBMITTED BY DEPT

AN SBIR PHASE II PROGRAM IS PROPOSED TO EXAMINE THE INFLUENCE OF TOUGHENED COMPOSITES ON THE DESIGN OF PRIMARY STRUCTURES FOR U.S. ARMY AIRCRAFT. THE PROPOSED PROGRAM IS A FOLLOW-ON STUDY TO A PHASE I SBIR CONTRACT CONDUCTED FOR THE U.S. ARMY AVIATION APPLIED TECHNOLOGY DIRECTORATE (AATD) IN WHICH CANDIDATE TOUGHENED MATRIX MATERIALS WERE EVALUATED. THE PHASE II PROGRAM WILL AUGMENT THE ARMY'S EXISTING COMPOSITES DATABASE DEVELOPED IN THE ADVANCED COMPOSITE AIRFRAME PROGRAM (ACAP) BY EXAMINING THE PROPERTIES AND DESIGN POTENTIAL OF FIBER-REINFORCED COMPOSITES WITH THESE TOUGHENED MATRIX MATERIALS. JOINTLY, SIMULA INC. AND ITS SUBCONTRACTOR, BELL HELICOPTER TEXTRON, WILL SELECT A CANDIDATE STRUCTURAL COMPONENT FROM THE BELL ACAP DESIGN. FUNCTIONAL REQUIREMENTS, LOADING CONDITIONS AND DESIGN ALLOWABLES DEVELOPED FOR THE ACAP COMPONENT WILL FORM THE BASELINE FOR EVALUATION OF THESE RECENTLY-DEVELOPED TOUGHENED COMPOSITE MATERIALS. THE GOAL OF THE PROGRAM WILL BE TO IDENTIFY WEIGHT, PERFORMANCE AND COST ADVANTAGES THAT THE TOUGHENED COMPOSITE MATERIALS COULD OFFER. DESIGN FACTORS SUCH AS FRACTURE TOUGHNESS, FATIGUE AND CREEP BEHAVIOR, PAINTABILITY, SOLVENT RESISTANCE, AND BOND CHARACTERISTICS WILL BE EXAMINED. AN OPTICAL TASK TO BUILD, TEST AND EVALUATE A MODIFIED VERSION OF THE ACAP COMPONENT WITH TOUGHENED COMPOSITE MATERIALS IS PRESENTED.

SONEX ENTERPRISES INC ARMY
3998 FAIR RIDGE DR - STE 220
FAIRFAX, VA 22033
CONTRACT NUMBER:
DONALD J MATCHINSKI
TITLE:
EXTEND SOFTWARE TEST PLAN GENERATOR
TOPIC# 76 OFFICE: CECOM/AMSEL

THE PURPOSE OF THIS WORK IS TO SEMI-AUTOMATICALLY PRODUCE SOFTWARE TEST PLANS IN ACCORDANCE WITH DOD STANDARD 2167. THE INPUTS WILL BE EVALUATED BY AN EXPERT SYSTEM COMPONENT THAT QUERIES THE USER FOR DISCREPANCY RESOLUTION, MISSION DATA, AND PRIORITIZATION. THIS RESEARCH IS A COMPONENT OF A LARGER SOFTWARE TESTING ARCHITECTURE THAT INCLUDES REQUIREMENTS ANALYSIS AND TESTING RESULTS ANALYSIS. THE OVERALL ARCHITECTURE INCLUDES A TARGET ENVIRONMENT ANALYZER, SOFTWARE METRIC MODELING, TEST BED INTERFACE AND AN OFF-THE-SHELF TOOLS (COMPUTER ASSISED SOFTWARE ENGINEERING, MANAGMENT, CONFIGURATION

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MANAGEMENT, ETC.) INTERFACE. ALSO, INTEGRATED INTO THIS ARCHITECTURE IS THE EXISTING T TOOL, THAT TAKES BOTTOM LEVEL DECOMPOSED REQUIREMENTS AND PRODUCTS COMPREHENSIVE TEST DATA CASES. THE TEST DESIGN SUBSYSTEM, THE SUBJECT OF THIS RESEARCH, IS BROKEN UP INTO TEST ISSUES AND CRITERIA, TEST STRATEGY, TEST RESOURCES, TEST DATA GENERATION, AND TEST PLANS AND PROCEDURES MODULES. THE KNOWLEDGE BASE COMPONENTS OF THIS SYSTEM WILL WORK WITH CAPTURED EXPERT EXPERIMENT IN SPECIFIC AREAS SUCH AS FORMAL/INFORMAL TEST MIX CRITERIA, TEST RISK ASSESSMENT, TESTING OPERATIONS, ALLOCATION OF RESOURCES, DATA COLLECTION REQUIREMENTS AND OTHER JUDGEMENTAL AREAS TO PRODUCE A SOFTWARE TEST PLAN.

SPACE POWER INC AF
1977 CONCOURSE DR
SAN JOSE, CA 95131
CONTRACT NUMBER: F33615-87-C-2812
WILLIAM D JACKSON
TITLE:
MID VOLTAGE POWER CONDITIONING FEASIBILITY INVESTIGATION
TOPIC# 173 OFFICE: AFWAL/PO

MEGAWATT AND MULTI-MEGAWATT CLASS SPACED-BASED ELECTRICAL POWER SUPPLIED PRODUCING POWER WILL REQUIRE TRANSMISSION VOLTAGES OF 1000V-2000V TO REDUCE MASSES OF LONG BUS BARS BETWEEN POWER SOURCE AND PAYLOAD. MANY POWER SUPPLIES, HOWEVER, ONLY PRODUCE VOLTAGES IN THE 100V RANGE. THIS PROJECT ADDRESSES THE NEED FOR A LOW-MASS, EFFICIENT, VOLTAGE-STEP-UP POWER CONDITIONER TO CONNECT THE POWER SUPPLY TO THE BUS BAR. SPACE POWER INC. (SPI) HAS SUCCESSFULLY DEMONSTRATED THE FEASIBILITY OF THIS TYPE OF POWER CONDITIONER IN A SUBSCALE TEST DURING PHASE I OF THIS WORK. BASED ON THE PHASE I RESULTS, EFFICIENCIES OF GREATER THAN 95% ARE PROJECTED AT A SPECIFIC MASS OF 0.1 kg/kWe FOR A FULL SCALE PCU. THE POWER CONDITIONER CONSISTS OF 50 kWe MODULES WHICH MAY BE COMBINED FOR OPERATION AT ARBITRARILY HIGH TOTAL POWER. THE PRIMARY OBJECTIVE OF PHASE II OF THIS PROGRAM IS TO DEVELOP AND THOROUGHLY TEST A 50 kWe MODULE OF A FLIGHT-WEIGHT PROTOTYPE. DURING PHASE III, THESE PROTOTYPE MODULES WILL BE FLIGHT QUALIFIED AND RADIATION TESTED. ARRANGEMENTS FOR MANUFACTURING OF POWER CONDITIONERS CUSTOM DESIGN FOR SPECIFIC SPACE CRAFT APPLICATION.

SPACE TECH CORP SDIO
2324 MANCHESTER CT
FORT COLLINS, CO 80526
CONTRACT NUMBER:
MICHAEL ANDREWS
TITLE:
COMPUTER ARCHITECTURE/VERY HIGH LEVEL LANGUAGE DESIGN FOR BATTLE MANAGEMENT
TOPIC# 9 OFFICE:

SUBMITTED BY DEPT

ULTRAFAST, REAL-TIME, SURVIVAL SIGNAL/DATA PROCESSING ARCHITECTURES ARE NEEDED TO MEET BALLISTIC MISSILE DEFENSE REQUIREMENTS. AS ONE APPROACH, THE SIGNED BINARY NUMBER REPRESENTATION (SBNR) COULD BE EMPLOYED TO ELIMINATE CARRY/BORROW PROPAGATION CHAINS AND, THUS, REDUCE INTERCONNECT REQUIREMENTS. THE RESULTANT AREA SAVINGS ON AN INTEGRATED CIRCUIT COULD BE EMPLOYED EFFECTIVELY TO ENHANCE FAULT TOLERANCE. UNDER THE INITIAL RESEARCH PHASE, THE FEASIBILITY WAS EXAMINED OF AN OPTIMAL DESIGN FOR COMBINING IN PROCESSING ELEMENTS THE INHERENT FAULT-TOLERANT PROPERTIES OF SYSTOLIC ARRAYS AND REDUNDANT NUMBER REPRESENTATION. IN THE CURRENT RESEARCH EFFORT, IMPLEMENTATION OF RESIDUE NUMBER SYSTEM IMBEDDED SIGNED DIGITS ARE BEING DEVELOPED. SELECTION AND COMPARISON OF ALTERNATIVE SYSTOLIC ARRAY PROCESSOR ELEMENTS ARE BEING ACCOMPLISHED. QUANTIFIABLE FIGURES-OF-MERIT FOR THE SEVERAL ALTERNATIVE DATA/SIGNAL PROCESSING ALGORITHMS ARE BEING MADE. OPTIMAL BUILT-IN SELF-TEST CIRCUITS ARE BEING COMPARED TO INCREASED FUNCTIONALLY CHIP SPACE REQUIREMENTS TO IDENTIFY IMPROVED, HIGH-SPEED, HIGHLY SURVIVABLE, FAULT-TOLERANT, ALGORITHM-DRIVEN ARCHITECTURES. IN ADDITION TO DEFENSE AND SPACE USES WITH INTENSIVE SIGNAL PROCESSING REQUIREMENTS, APPLICATIONS INCLUDE EXPEDITED INTENSIVE SIGNAL PROCESSING CATSCAN, SONOGRAM, AND NUCLEAR MAGNETIC RESONANCE EQUIPMENT.

SPARTA INC SDIO
11048 CAMINO DEL MAR
DEL MAR, CA 92014
CONTRACT NUMBER:
STUART N ROSENWASSER
TITLE:
HIGH PERFORMANCE ACTIVELY COOLED RAILS DEVELOPMENT FOR RAPID FIRE ELECTROMAGNETIC LAUNCHERS
TOPIC# 2 OFFICE:

ELECTROMAGNETIC LAUNCHER MISSIONS REQUIRED PROJECTILES TO BE FIRED IN A REPETITIVE MODE. TO BE FEASIBLE, EFFICIENT ACTIVE COOLING OF THE RAIL IS REQUIRED TO REMOVE THE LARGE THERMAL ENERGY DEPOSITED DURING EACH SHOT. CONVENTIONAL ACTIVE COOLING TECHNOLOGY CANNOT ACHIEVE THE REQUIRED THERAML PERFORMANCE. DURING THE PREVIOUS RESEARCH PHASE, THE HEAT REMOVAL RATES FOR SEVERAL RAILGUNS CURRENTLY BEING DEVELOPED FOR DESIGN AND FABRICATION FEASIBILITY WAS DEMONSTRATED TO INTEGRATING ADVANCED FORCED CONVECTION TECHNIQUES WITH A UNIQUE SOLID STATE BOND-

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ING PROCESS TO PRODUCE TAILORED CHANNEL COOLED RAIL STRUCTURES. IN THE CURRENT RESEARCH EFFORT, THESE ACTIVELY COOLED RAIL CONCEPTS ARE BEING OPTIMIZED AND DEMONSTRATED FOR A RANGE OF RAILGUN SYSTEMS. THE DESIGNS AND SUBSCALE COOLED RAILS PREVIOUSLY FABRICATED ARE BEING VERIFIED FOR THERMAL/STRUCTURAL PERFORMANCE WITH THERMAL-HYDRAULIC AND SMALL RAILGUN TESTS. THE COOLED RAIL CONCEPTS FOR HIGH AND LOW FIRE RATE MISSIONS ARE BEING OPTIMIZED WITH RESPECT TO THERMAL DESIGN, COOLANT CHANNEL CONFIGURATION, MATERIAL PROPERTY TAILORING, AND FABRICATION PROCESSES. THE THERMAL PERFORMANCE LIMITS OF THE CONCEPTS ARE BEING DETERMINED THROUGH ANALYSIS AND SUBSCALE TESTING. A SELECTED OPTIMIZED DESIGN IS BEING SCALED UP AND THE UTILITY AND THERMAL/STRUCTURAL PERFORMANCE OF FULL SIZE COOLED RAIL SEGMENTS IS BEING VERIFIED IN A LARGE RAILGUN.

SPARTA INC AF
1055 WALL ST - STE 200
LA JOLLA, CA 92038
CONTRACT NUMBER: F33615-87-C-3249
JOHN J GLATZ
TITLE:
STRUCTURAL JOINING METHODS FOR DISSIMILAR METALS
TOPIC# 128 OFFICE: AFWAL/FI

SPARTA, INC. PROPOSES A PROGRAM TO DEVELOP APPLICATIONS OF AN INNOVATIVE, LOW TEMPERATURE SOLID STATE BONDING TECHNIQUE TO PRODUCE JOINTS WITH A MINIMUM AMOUNT OF GROSS DEFORMATION, THERMAL DISTORTION, RESIDUAL STRESSES OR LOSS OF STRENGTH IN THE MATERIALS TO BE JOINED. THE OBJECTIVE OF THE PHASE II WORK IS TO EXPAND THE BONDING PROCESS DEMONSTRATED IN THE PHASE I STUDY TO OTHER STRUCTURAL COMPONENT APPLICATIONS AND THEIR ASSOCIATED ADHEREND MATERIALS AND FUNCTIONAL TEMPERATURE RANGES. THE RESULTS OF THE STUDY SHALL BE PROCESSES THAT CAN BE USED TO FABRICATE DIFFERENT JOINTS DESIGNED FOR APPLICATION ON AIR FORCE JOINING PROBLEMS. THE STUDY APPROACH INCLUDES THE FOLLOWING: 1) IDENTIFICATION OF CANDIDATE JOINING APPLICATIONS AND THE ASSOCIATED FUNCTIONAL REQUIREMENTS; 2) DESIGN OF THE JOINT TECHNOLOGY DEVELOPMENT TEST SPECIMENS; 3) DESIGN OF JOINT DEMONSTRATION COMPONENTS; 4) OPTIMIZATION OF THE MANUFACTURING PROCESS ON SCREENING COUPON SPECIMENS; 5) FABRICATION OF SCALED-UP DEMONSTRATION COMPONENTS; 6) TESTING OF THE COUPON AND DEMONSTRATION COMPONENTS AND; 7) DOCUMENTATION OF THE RESULTS.

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SPARTA INC AF
1055 WALL ST - STE 200
LA JOLLA, CA 92037
CONTRACT NUMBER:
DR LOWELL D MCMILLEN
TITLE:
EJECTABLE PRECURSOR JAMMERS TECHNOLOGY DEVELOPMENT
TOPIC# 265 OFFICE: BMO/MYSC

A STUDY IS PROPOSED TO DEVELOP AN AERODYNAMIC AND THERMODYNAMIC TECHNOLOGY DATA BASE FOR THE DESIGN AND EVALUATION OF EJECTABLE PRECURSOR JAMMERS. THE SCOPE OF THIS PROGRAM WILL BE TO ESTABLISH THE AERODYNAMIC AND AEROTHERMODYNAMIC REQUIREMENTS FOR LIGHTWEIGHT EJECTABLE JAMMERS; TO REVIEW, DEVELOP OR MODIFY APPLICABLE ANALYSIS TECHNIQUES; TO EVALUATE THE AERODYNAMIC AND THERMODYNAMIC PERFORMANCE OF EJECTABLE PRECURSOR JAMMER CONCEPTS; AND TO DEVELOP TECHNOLOGY DEVELOPMENT PLANS FOR TECHNOLOGY DEFICIENCIES IDENTIFIED IN THIS STUDY.

SPEC-TRAN CORP AF
50 HALL RD
STURBRIDGE, MA 01566
CONTRACT NUMBER:
PHILIP LEVIN
TITLE:
LONG LENGTH FLUORIDE FIBER
TOPIC# 52 OFFICE: RADC/DOR

HEAVY METAL FLUORIDE GLASS FIBERS ARE APPROACHING THE STAGE OF PRACTICAL USE, WITH POTENTIAL OF REACHING ULTRA LOW LOSSES IN THE MID IR. WHILE MANY RESEARCH LABORATORIES ARE WORKING ON LOWERING THE OPTICAL LOSSES, VERY LITTLE ATTENTION WAS PAID TO THE FIBER LENGTH. THE GOAL OF THE PROGRAM WILL BE DEVELOPMENT OF A TECHNIQUE TO DRAW LONG LENGTH (500m) FIBER WITH MEDIUM-LOW LOSSES (<100 dB/km) AND MEDIAN STRENGTH OF 50 kpsi OR HIGHER, FROM A SINGLE PREFORM. THE GOAL WILL BE ACCOMPLISHED BY INCREASING THE PREFORM LENGTH AND INCREASING THE PREFORM DIAMETER BY OVERCLADDING THE FLUORIDE GLASS WITH OXIDE GLASS. THE NEW IDEA, INVENTED AT SPECT-TRAN UNDER

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PHASE I OF THIS CONTRACT, GREATLY IMPROVES THE FIBER STRENGTH, DRAWING PROPERTIES AND WILL IMPROVE, WHEN FULLY OPTIMIZED, THE LIFETIME OF THE FIBER. APPROXIMATELY 3.25 MAN YEARS LEVEL OF EFFORT WILL BE REQUIRED FOR SUCCESSFUL COMPLETION OF THIS TWO YEAR PROGRAM.

SPECIAL ILLUMINATION SYSTEMS INC AF
444 VOLUSIA AVE
DAYTON, OH 45409
CONTRACT NUMBER: 88-25036
LEE A CROSS
TITLE:
A CAMERA SYSTEM FOR BEHIND-PANEL FRAGMENTATION
TOPIC# 26 OFFICE: AFATL/AGI

A NOVEL OPTICAL DIAGNOSTIC APPARATUS FOR BEHIND-PANEL FRAGMENTATION STUDIES IS PROPOSED. CONVENTIONAL WISDOM DICTATATES THAT THERE WILL BE TWO FACTORS PREVENTING THE USE OF VISIBLE-LIGHT CAMERAS FOR FRAGMENTATION DATA ACQUISITION. THESE ARE: (a) THE IMPACT FLASH AND (b) THE HIGH DENSITY OF THE FINE DEBRIS CLOUD GENERATED WHEN A TARGET PANEL IS PENETRATED. HOWEVER, DATA GATHERED DURING PHASE I OF THIS PROGRAM HAS DEMONSTRATED CONCLUSIVELY THAT, WITH THE PROPER SORT OF ILLUMINATION, I.E., VIA A LASER, THAT THE IMPACT FLASH IS OF NO IMPORTANCE IN BACK-LIT PHOTOGRAPHY. ALSO, IMAGES WERE RECORDED THAT PROVIDE VERY STRONG EVIDENCE THAT THE DEBRIS CLOUD CAN BE PENETRATED TO REVEAL THE PRESENCE OF FRAGMENTS BURIED IN THE CLOUD. THIS PROPOSAL DESCRIBES HOW IT IS POSSIBLE TO BUILD UPON THESE PREVIOUS EXPERIMENTS TO PERMIT THE DEVELOPMENT OF A SEMI-AUTOMATIC FRAGMENTATION DATA ANALYSIS SYSTEM USING A LASER-ILLUMINATED CRANZ-SCHARDIN CAMERA.

SPECTRAL SCIENCES INC SDIO
111 S BEDFORD ST
BURLINGTON, MA 01803
CONTRACT NUMBER:
DR LAWRENCE BERNSTEIN
TITLE:
PRECISE MISSILE BODY LOCATION USING VACUUM CORE EMISSION
TOPIC# 3 OFFICE:

SUBMITTED BY DEPT

A MAJOR LIMITATION OF USING PASSIVE PLUME IMAGERY TO LOCATE A MISSILE BODY IS THE DIFFICULTY OF DETECTION OF DIM PLUMES AGAINST A BRIGHT BACKGROUND, SUCH AS THE EARTH OR THOSE CREATED BY INFRARED COUNTER-MEASURES. A SPECTRAL FILTERING CONCEPT ENHANCES THE CONTRAST BE-TWEEN THE PLUME AND BACKGROUND EMISSIONS. IN THE PREVIOUS RESEARCH PHASE, THE FEASIBILITY OF THIS CONCEPT WAS DEMONSTRATED USING COMPUTER SIMULATION OF THE PLUME, BACKGROUND, AND FILTER SPECTRAL CHARAC-TERISTICS. THE POTENTIAL FOR ACHIEVING A HUNDRED FOLD INCREASE IN PLUME-TO-BACKGROUND CONTRAST WAS DEMONSTRATED. IN THE CURRENT RE-SEARCH EFFORT, A BRASSBOARD SENSOR BASED ON THIS TECHNOLOGY IS BEING DEVELOPED AND ITS USE DEMONSTRATED AGAINST ROCKET MOTOR FIRINGS A HIGH ALTITUDE TEST CHAMBER. A LABORATORY SIMULATION OF THE SENSOR CONCEPT IS BEING USED TO OPTIMIZE SPECTRAL BAND SELECTION AND OTHER IMPORTANT PARAMETERS FOR THE BRASSBOARD SENSOR. PREVIOUSLY DEVELOPED COMPUTER MODELS ARE BEING MODIFIED AND APPLIED TO DESIGN AND DATA ANALYSIS FOR THE LABORATORY AND BRASSBOARD SENSORS. THE TECHNOLOGY, WHEN SUCCESSFULLY DEVELOPED, COULD BE APPLIED TO LOCATING MISSILE BODIES USING PLUME IMAGERY, DETECTING STRATEGIC AIRCRAFT FROM SPACE BORNE SENSORS, AND WARNING TACTICAL AIRCRAFT OF THREAT TACTICAL MISSILES.

SPIRE CORP SDIO
PATRIOTS PARK
BEDFORD, MA 01730
CONTRACT NUMBER:
WARD D HALVERSON
TITLE:
NEUTRAL PARTICLE BEAM LOCATION AIMING CALIBRATION AND TARGET HIT IDENTIFICATION
TOPIC# 1 OFFICE:

THE DETERMINATION OF MISS-VECTOR AND IDENTIFICATION OF HITS ON TARGET BY A NEUTRAL PARTICLE BEAM (NPB) IN SPACE IS A SERIOUS PRO-BLEM. A NPB VECTOR LOCATION SYSTEM NEEDS TO BE DEVELOPED. UNDER THE PREVIOUS RESEARCH PHASE, THE FEASIBILITY WAS SUPPORTED OF UTILIZING FLUORESCENCE GENERATED BY COLLISIONS BETWEEN HIGH ENERGY NEUTRAL PARTICLE BEAMS AND ATMOSPHERIC MOLECULES TO LOCATE THE BEAM POSITION VECTOR WITH RESPECT TO THE INERTIAL FRAME-OF-REFERENCE OF THE ACCELERATOR POINTING SYSTEM. CALIBRATION OF THE POINTING SYSTEM CAN BE ACCOMPLISHED USING A RELATIVELY MODEST IMAGING SENSOR TO DETECT

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NEAR-ULTRAVIOLET RADIATION AND/OR VACUUM-ULTRA-VIOLET IN THE 120 nmD TO 200 nm RANGE. THE FEASIBILITY ALSO WAS DEMONSTRATED TO DETECTING BEAM POSITION WITH RESPECT TO THE MOVING TARGET AND DETECTING DIRECT HITS BY OCCULTATION OF ATMOSPHERIC FLURESCENCE GENERATED BEHIND AND BELOW THE TARGET. THE CURRENT RESEARCH EFFORT IS REFINING THE PREVIOUS RESEARCH TO INCLUDE A DETAILED ANALYSIS OF THE SPECTRAL AND TEMPORAL DEPENDENCE OF FLUORESCENCE SIGNALS AND BACKGROUND EMISSIONS UNDER WORST CASE GEOPHYSICAL CONDITIONS AND BEAM POINTING GEOMETRY. SENSOR SYSTEM ANALYSIS IS BEING UNDERTAKEN TO OPTIMIZE OPTICAL RADIOMETRY AND IMAGING SYSTEMS IN PREPARATION FOR PLANNING LABORATORY AND FLIGHT EXPERIMENTS. THE OPTIMIZED SENSOR SYSTEM IS BEING INCORPORATED INTO PRELIMINARY DESIGNS FOR A LABORATORY BREADBOARD AND A FLIGHT TEST EXPERIMENT.

SPIRE CORP AF
PATRIOTS PK
BEDFORD, MA 01730
CONTRACT NUMBER:
STANLEY M VERNON
TITLE:
HIGH QUANTUM EFFICIENCY PHOTOCATHODES FOR DETECTION OF 1.06 (um) MICROMETER RADIATION
TOPIC# 62 OFFICE: AFSTC/OLAB

LOW-NOISE PHOTOCATHODES ABLE TO DETECT 1.06 um-WAVELENGTH RADIATION WITH REASONABLE EFFICIENCY ARE NEEDED FOR A VARIETY OF APPLICATIONS INCLUDING SPACEBORNE LIDAR SENSOR SYSTEMS UTILIZING Nd:YAG LASERS. THE PHASE I PROGRAM DEMONSTRATED THAT GaInAs LAYERS GROWN BY METAL-ORGANIC CHEMICAL VAPOR DEPOSITION ONTO GaAs SUBSTRATES ARE SUITABLE FOR THE PRODUCTION OF PHOTOCATHODE DETECTORS HAVING GOOD SENSITIVITY TO 1.06 um RADIATION. PRELIMINARY EXPERIMENTS RESULTED IN THE FABRICATION OF A REFLECTION-MODE PHOTOCATHODE HAVING A 1.06 um QUANTUM EFFICIENCY OF 0.23%, WHICH IS BELIEVED TO BE HIGHER THAN THE PRESENTLY COMMERCIALLY AVAILABLE DEVICES. THE PHASE II R&D EFFORT WILL SEEK TO DEVELOP A COMPLETE DETECTOR ASSEMBLY UTILIZING A GaInAs NEGATIVE-ELECTRON-AFFINITY TRANSMISSION-MODE PHOTOCATHODE TUBE. THE TASKS WILL INCLUDE THE DESIGN AND GROWTH OF A GaInAs-AlGaInAs MULTILAYER CATHODE STRUCTURE AND OPTIMIZATION OF THE FABRICATION SEQUENCE NEEDED TO PRODUCE HIGH QUANTUM EFFICIENCY DETECTORS.

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SPRINGBORN LABS INC ARMY
10 SPRINGBORN CTR
ENFIELD, CT 06082
CONTRACT NUMBER:
ROY A WHITE
TITLE:
HEAT SEALABLE SEWING THREAD
TOPIC# 135 OFFICE: NRDEC

A PHASE I PROGRAM WITH NRDEC DEMONSTRATED THE FEASIBILITY OF THE BASIC CONCEPT OF COATING A SEWING THREAD WITH HOT MELT ADHESIVE, USING THE COATED THREAD TO SEW A GORE-TEX/SHELL FABRIC LAMINATE, AND THEN SEALING THE RESULTING NEEDLE HOLES BY APPLICATION OF HEAT. THIS PHASE II PROGRAM WILL DEVELOP A SEWING AND IN-LINE SEALING PROCESS USING A "UNIVERSAL" HEAT SEAL COATING. THIS PROCESS AND COATING WILL BE ADAPTABLE TO A VARIETY OF COATED FABRICS FOR MILITARY USE INCLUDING GORE-TEX COATED NYCO AND NOMEX/KEVLAR, VINYL COATED POLYESTER TENTAGE, AND NEOPRENE COATED FABRICS. A VARIETY OF COATING RESINS WILL BE SCREENED FOR ADHESION TO THE DESIRED SUBSTRATES, FLOW OUT, AND SURFACE FRICTION. COATED THREAD WILL BE USED TO SEW AND SEAL FABRIC SAMPLES WHICH WILL BE SUBJECTED TO HYDROSTATIC TESTING. PROTOTYPE IN-LINE SEALING CONCEPTS WILL BE TESTED AND THE MOST PROMISING USED AS THE BASIC FOR A PROTOTYPE SEW AND SEAL UNIT. A SET OF UNIFORMS, SEWN AND SEALED WITH THE FINAL MATERIAL/PROCESS, WILL BE SUBMITTED TO NRDEC FOR WEAR TESTING.

SPUTTERTEX CORP AF
10575 NEWKIRK - STE 790
DALLAS, TX 75220
CONTRACT NUMBER:
BOYD L JUSTICE
TITLE:
PHOTOCHROMIC ELECTRICAL AND THERMAL PROPERTIES OF FLUID FILLED TRANSPARENCIES
TOPIC# 141 OFFICE: AFWAL/FI

THIS PROGRAM EFFORT IS DIRECTED TOWARDS DESIGNING AND BUILDING CANOPY PROTOTYPE MODELS THAT ADDRESS THE PROBLEM OF SURFACE HEAT, IR HEATING,

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INCANDESCENT FLASH PROTECTION, AND SURFACE HARDNESS. TECHNIQUES TO BE EMPLOYED TO SOLVE THESE PROBLEMS INCLUDE DESIGN AND CONSTRUCTION OF A THERMOELECTRIC COOLED CIRCULATING FLUID SYSTEM THAT CONTAINS IR ABSORBING DYES, UTILIZES A HEAT REFLECTING GOLD LAYER, AND A COMMAND CONTROLLED DYE RESERVOIR AND VALVE SYSTEM TO ACHIEVE RAPID CANOPY OPACIFICATION. A PHOTOCHROMIC ELECTROPHORETIC SYSTEM WILL ALSO BE INCORPORATED INTO THE STRUCTURE TO ACHIEVE AN ULTRAFAST FLASH PROTECTION. THIS SYSTEM WILL USE PHOTOCHROMIC DYES AND A BILAYER OF CONDUCTIVE SESMITRANSPARENT FILM, ONE OF WHICH WILL BE USED TO STORE THE DYE IN THE TRANSPARENT MODE AND ONE FOR THE OPAQUE MODE. SEVERAL OUTER HARD COATING MATERIALS WILL BE TESTED. MODEL PROTOTYPES WILL BE TESTED FOR TRANSPARENCY, THERMAL EFFICIENCY, AND OPTICAL PROPERTIES AND RATES FOR TRANSPARENCY AND DARKENING. THESE MODELS WILL PROVIDE THE DESIGN AND DATA ESSENTIAL FOR BUILDING A CANOPY-WINDOW PRODUCT IN A PHASE III PRODUCTION EFFORT.

SRS TECHNOLOGIES SDIO
990 EXPLORER BLVD NW
HUNTSVILLE, AL 35806
CONTRACT NUMBER:
DR RICHARD D KRAMER
TITLE:
ANNULAR FLOW ELECTROTHERMAL PLUG RAMJET INVESTIGATION AS A HYPERVELOCITY PROJECTILE LAUNCHER
TOPIC# 2 OFFICE:

AS AN ALTERNATIVE TO CHEMICAL ROCKETS AND ELECTROMAGNETIC LAUNCHERS, NEW APPROACHES ARE REQUIRED FOR ACCELERATING AND LAUNCH HYPERVELOCITY PROJECTILES AND KILL VEHICLES. THE ELECTROTHERMAL RAMJET (ETR) POTENTIALLY OFFERS ADVANTAGES AS A HYPERVELOCITY LAUNCHER CONCEPT BECAUSE IT DOES NOT REQUIRE ACCELERATION OF THE PROPULSION SYSTEM OR PROPELLANT RESULTING IN A LARGER SPECIFIC ENERGY TRANSFER INTO PROJECTILE KINETIC ENERGY. UNDER THE PREVIOUS RESEARCH EFFORT, THE FEASIBILITY OF THE ETR LAUNCHER CONCEPT WAS EXAMINED AND ANALYZED. THE KINEMATIC REQUIREMENTS OF GROUND AND SPACE-BASED WEAPONS WERE INVESTIGATED IN ORDER TO PARAMETRICALLY EXAMINE A VARIETY OF POTENTIAL ETR CONFIGURATION CONCEPTS. UNDER THE CURRENT RESEARCH EFFORT, THE CONCEPT IS BEING VERIFIED OF ENERGY TRANSFER VIA ARC DISCHARGE INTO THE PROPELLANT GAS IN AN ETR TUBE WITH A RESULTING ACCELERATION OF A RAMJET PROJECTILE. ALTERNATE OPTIONS ARE BEING EVALUATED FOR

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VELOCITY INITIATIONS, ENERGY ADDITION, AND THE TWO-STAGE ETR. THE TECHNOLOGY DEVELOPMENT REQUIREMENTS FOR A TACTICAL WEAPONS SYSTEM ARE BEING IDENTIFIED AND PRIORITIZED AND A PROTOTYPE SYSTEM CONCEPT SPECIFIED FOR A DEMONSTRATION PROGRAM. AN ETR PROJECTILE LAUNCHER, WHEN SUCCESSFULLY DEMONSTRATED, COULD BE USED AS BOTH AN ENDO AND EXO KINETIC ENERGY WEAPON SYSTEM FOR ENGAGEMENT OF REENTRY VEHICLES WITHIN EITHER THE TERMINAL OR MIDCOURSE (EARLY AND LATE) PHASES.

SRS TECHNOLOGIES NAVY
990 EXPLORER BLVD NW
HUNTSVILLE, AL 35806
CONTRACT NUMBER:
JEFFREY S YALOWITZ
TITLE:
FAULT TOLERANT SYSTEM DESIGN AND EVALUATION ALGORITHMS
TOPIC# 83 OFFICE: NAVAIR/NSWC

NEW FAULT TOLERANT ALGORITHMS AND MODELING ENVIRONMENTS ARE REQUIRED FOR EFFECTIVE RELIABILITY DESIGN AND EVALUATION OF MODERN COMPLEX MULTIPROCESSING SYSTEMS USED IN WEAPON SYSTEMS, FLIGHT CONTROL SYSTEMS, AND OTHER CIRITICAL APPLICATIONS. THE PHASE I EFFORT ESTABLISHED FEASIBILITY OF THE DYNAMIC NETWORK MODELING APPROACH TO FAULT TOLERANCE EVALUATION AND PROVIDED PRELIMINARY ALGORITHM DESIGNS AND SPECIFICATIONS. EMPHASIS WAS PLACED ON FAULT TOLERANT TECHNIQUES WHICH ARE OFTEN USED IN COMPUTER AND COMMUNICATIONS NETWORKS AT MULTIPLE LEVELS OF SYSTEM DETAIL (E.G., SYSTEM, EQUIPMENT, CIRCUIT CARD). IN PHASE II, SRS WILL PERFORM PRINCIPAL RESEARCH, DEVELOPMENT AND DEMONSTRATION OF INNOVATIVE COMPUTER-AIDED ENGINEERING (CAE) DYNAMIC NETWORK MODELING TOOLS TO SYSTEMATICALLY EVALUATE RELIABILITY AND FAULT TOLERANT CHARACTERISTICS OF COMPLEX AND ADAPTIVE SYSTEMS. TEMPLATE ALGORITHMS WILL BE DESIGNED TO PROVIDE CANONICAL REPRESENTATIONS OF SYSTEM ELEMENTS, TOPOLOGY FEATURES, HUMAN PROCESSES, AND FAULT TOLERANCE PROCESSES. EVALUATION MEASURES WILL INCLUDE RELIABILITY, AVAILABILITY, TRAFFIC LOADING, AND GRACEFUL DEGRADATION CAPABILITY.

SRS TECHNOLOGIES AF
555 SPARKMAN DR - STE 1406
HUNTSVILLE, AL 35816
CONTRACT NUMBER:
DR RICHARD D KRAMER
TITLE:
THIN FILM CREEP-FORMING FOR SOLAR THERMAL PROPULSION APPLICATIONS
TOPIC# 77 OFFICE: AFRPL/TSTR

SUBMITTED BY DEPT

CREEP-FORMING IS BASED ON THE VISCOELASTIC BEHAVIOR OF POLYMERS IN WHICH A TIME-DEPENDENT DEFORMATION OCCURS UNDER A CONSTANT LOAD AND AT AN ELEVATED TEMPERATURE. DURING THE PROCESS, THE THIN FILM IS STRESSED BELOW THE YIELD STRENGTH TO PREVENT EXCESSIVE PLASTIC DEFORMATION WHICH OCCURS ABOVE THE KNEE OF THE STRESS-STRAIN CURVE AND IS HEATED BELOW THE GLASS TRANSITION TEMPERATURE TO AVOID THE DEGRADATION OF MECHANICAL PROPERTIES. THE PHASE I RESEARCH EVALUATED THE CREEP BEHAVIOR OF 0.3 MIL AND THICKER METALLIZED POLYIMIDE FILM AND DEFINE THE PROCESSING PARAMETERS FOR LARGE-SCALE CREEP-FORMING WHICH IS NECESSARY FOR OPERATIONAL-SIZE SOLAR CONCENTRATORS. ANALYTICAL MODELS WERE EVALUATED BASED ON THEIR CORRELATION WITH CREEP TEST DATA. THE MODELS QUANTIFIED THE CREEP-FORMING PARAMETERS REQUIRED FOR OBTAINING THE DESIRED PRE-SHAPED GEOMETRIES. OPERATIONAL REFLECTOR SYSTEMS WILL REQUIRE FILM SEAMING TO MEET THE REFLECTING SURFACE AREA REQUIREMENTS. THE FILM CREEP BEHAVIOR WITHIN A SEAMED REGION IS SIGNIFICANTLY DIFFERENT FROM THAT OF HOMOGENEOUS FILM. UNIAXIAL SEAMED FILM CREEP TESTS WERE CONDUCTED IN PHASE I TO ESTABLISH THE PARAMETERS FOR DESIRED CREEP-FORMING. THE PHASE I RESULTS ESTABLISHED THE FEASIBILITY OF QUANTIFYING AND ANALYTICALLY MODELING THE THIN FILM CREEP-FORMING PROCESS. THESE RESULTS DIRECTLY SUPPORT THE FULL QUANTIFICATION/DEVELOPMENT OF THE CREEP-FORMING PROCESS AND ITS APPLICATION IN PHASE II.

STATCON INC AF
2208 COUNTRYSIDE DR
SILVER SPRING, MD 20904
CONTRACT NUMBER: F29601-87-C-0053
DR MARK J BERAN
TITLE:
PHASED ARRAY IMAGING IN PARTIALLY COHERENT LIGHT
TOPIC# 83 OFFICE: AFWL/PRC

WE SHALL PERFORM NUMERICAL CALCULATIONS, VALID FOR ZENITH AND OFF-ZENITH VIEWING, TO ASSESS THE EFFECT OF ATMOSPHERIC TURBULENCE ON THE INTENSITY CORRELATION IMAGING PROCEDURE. FIRST, WE SHALL CALCULATE THE TWO-POINT INTENSITY CORRELATION FUNCTION WITH THE SPATIAL SPECTRUM AS AN INTERMEDIATE STEP. THESE CALCULATIONS ASSUME ISOPLANICITY. SUBSEQUENTLY, WE SHALL CALCULATE THE FIRST-ORDER CORRECTION RESULTING FROM NONISOPLANICITY. NEXT, WE SHALL ANALYZE THE EFFECT OF ATMOSPHERIC TURBULENCE ON MEASUREMENTS OF THE TRIPLE COR-

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RELATION FUNCTION. WE SHALL DERIVE A GENERAL FORMULATION WHICH INCLUDES NONISOPLANATIC EFFECTS. WE SHALL FIND PERTURBATION EXPRESSIONS FOR THE ISOPLANATIC CASE AND THE FIRST-ORDER ISOPLANATIC CORRECTION CONDITIONS. WE SHALL ALSO MAKE TWO-DIMENSIONAL CALCULATIONS TO QUALITATIVELY DETERMINE THE EFFECT OF STRONG TURBULENCE. WE PROPOSE TO CONDUCT A LABORATORY EXPERIMENT INVOLVING PROPAGATION OF LIGHT THROUGH TURBULENCE GENERATED IN A HEATED WATER TANK. SUCH AN EXPERIMENT CAN INCLUDE ALL THE IMPORTANT EFFECTS PRESENT IN A FIELD EXPERIMENT. WE SHALL BE ABLE TO MEASURE THE INDEX-OF-REFRACTION FLUCTUATIONS OF THE TURBULENCE SIMULTANEOUSLY WITH THE INTENSITY CORRELATION MEASUREMENTS. THIS WILL ALLOW AN UNAMBIGUOUS CHECK OF THE THEORY AND NUMERICAL SIMULATIONS AND ALLOW US TO SEE THE EFFECT OF APERTURE AVERAGING AND VARIOUS ARRAY CONFIGURATIONS UNDER IDENTICAL TURBULENCE CONDITIONS.

STRUCTURAL INTEGRITY ASSOCS INC AF
3150 ALMADEN EXPY - STE 226
SAN JOSE, CA 95118
CONTRACT NUMBER: F33615-87-C-3250
DR AN-YU KUO
TITLE:
STRESS INTENSITY FACTORS FOR CRACKING METAL STRUCTURES UNDER RAPID THERMAL LOADING
TOPIC# 136 OFFICE: AFWAL/FI

UNDER PHASE I OF THIS STUDY, A NOVEL METHOD WAS DEVELOPED AND DEMONSTRATED FOR CALCULATING CRACKTIP STRESS INTENSITY FACTORS FOR CRACKED METAL STRUCTURES UNDER RAPID THERMAL PULSE LOADINGS. THE METHOD COUPLES A GREEN'S FUNCTION INTEGRATION TECHNIQUE FOR TRANSIENT THERMAL STRESSES WITH THE WELL-KNOWN INFLUENCE FUNCTION APPROACH FOR CALCULATING STRESS INTENSITY FACTORS. A PRELIMINARY VERSION OF A COMPUTER PROGRAM IMPLEMENTING THE METHODOLOGY, DESIGNATED AF-CRACK, WAS DEVELOPED AND DELIVERED AS PART OF THE PHASE I EFFORT. OPERABLE ON AN IBM-PC OR COMPATIBLE, AF-CRACK DEMONSTRATES THE ABILITY TO ACCURATELY CALCULATE STRESS INTENSITY FACTORS, WITH VERY SHORT TURN-AROUND TIMES, AND IMMEDIATE GRAPHICS VISUALIZATION OF THE RESULTS. BASED ON THE SUCCESS OF THIS PHASE I FEASIBILITY STUDY, A PHASE II EFFORT IS PROPOSED HERE TO FURTHER DEVELOP AND VERIFY THE AF-CRACK SOFTWARE. THIS EFFORT WILL PRODUCE AN EASY TO USE, FAST AND ACCURATE GENERAL PURPOSE COMPUTER PROGRAM FOR DETERMINING STRESS INTENSITY

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FACTORS IN A WIDE AND ACCURATE GENERAL PURPOSE COMPUTER PROGRAM FOR DETERMINING STRESS INTENSITY FACTORS IN A WIDE RANGE OF METALLIC (AND OTHER) STRUCTURES OF INTEREST TO THE AIR FORCE, UNDER RAPID THERMAL PULSES AND OTHER FORMS OF THERMAL TRANSIENT LOADING. THE PHASE II SOFTWARE WILL ALSO PROVIDE A DIRECT LINK WITH OTHER FRACTURE MECHANICS PROGRAMS IN USE BY THE AIR FORCE FOR FLAW TOLERANT DESIGN OF AIRFRAMES AND OTHER CRITICAL STRUCTURES AND COMPONENTS.

SUSQUEHANNA RESOURCES & ENVIRONMENT INC ARMY
84 OAK ST
BINGHAMTON, NY 13905
CONTRACT NUMBER:
TIMOTHY D MASTERS
TITLE:
AUTOMATED/AIDED TARGET RECOGNITION (ATR) PROTOTYPE SYSTEM DEVELOPMENT
TOPIC# 29 OFFICE: ARDEC/SMCAR

WITH THE ARDEC SBIR PHASE I EFFORT, SR&E HAS PROVED THAT THE VAST MAJORITY OF TARGETS IN THE DARPA/ERIM PAIRSTECH FLIR IMAGERY CAN BE EXTRACTED BY SR&E ATR ALGORITHMS. SINCE ARDEC HAS DEVELOPED ALGORITHMS FOR OBJECT RECOGNITION USING SHAPE DESCRIPTORS, AN PROTOTYPE ATR DEMONSTRATION SYSTEM CAN BE DEVELOPED BY INTEGRATING THE SR&E AND THE ARDEC ATR TECHNOLOGIES. THE PHASE II EFFORT WILL ACCOMPLISH THIS GOAL IN THREE STAGES: SUBPHASE 1 IS A DESIGN STAGE WITH A THREE-MONTH EFFORT; SUBPHASE 2 IS TO DEVELOP A WORKABLE PROTOTYPE SYSTEM IN NINE MONTHS; AND SUBPHASE 3 IS TO DEVELOP THE FINAL PROTOTYPE SYSTEM IN TWELVE MONTHS. THE SYSTEM COMPONENTS ARE: A BASIC ATR LOGIC MODULE, A GUNNER DISPLAY, A MAN-MACHINE INTERFACE, A FEATURE DESCRIPTOR, AND A FIRE CONTROL MODULE. IN ADDITION, THE PHASE II EFFORT WILL INCLUDE TESTING OF THE GENERALITY OF THE SYSTEM WITH IMAGE DATA FROM VARIOUS SENSORS AND OVER VARYING TARGET BACKGROUND COMPLEXITIES. SR&E BELIEVES THAT THE DEVELOPED ATR PROTOTYPE SYSTEM CAN BE TRANSFERRED TO OTHER DOD-RELATED ATR SYSTEMS ONCE ITS CAPABILITY IS DEMONSTRATED AT ARDEC LABORATORY.

SYNETICS CORP NAVY
80 MAIN ST
READING, MA 01867
CONTRACT NUMBER: N00039-88-C-
J W ADAIR
TITLE:
FIBER OPTICS BASED LOCAL AREA NETWORK
TOPIC# 33 OFFICE: SPAWAR

SUBMITTED BY DEPT

THE TECHNICAL FEASIBILITY OF INTERFACING AN OPERATIONAL NAVY IFF SYSTEM (AN/UPX-24) WITH A HIGH PERFORMANCE FIBER OPTIC LOCAL AREA NETWORK (LAN) WILL BE DEMONSTRATED. SPECIFICATION AND DESIGN WORK TO SUPPORT THIS OBJECTIVE WILL BE ACCOMPLISHED. INTERFACE UNITS COMPRISING SIGNAL PROCESSORS, LAN CONTROLLER BOARDS, AND NECESSARY CIRCUITRY WILL BE FABRICATED AND TESTED. AN AN/UPX-24 IFF SYSTEM UTILIZING THE FIBER OPTIC LAN AND OPERATIONAL IFF EQUIPMENT COMPONENTS WILL BE ASSEMBLED AT A GOVERNMENT (NAY) FACILITY AT ST. INIGOES, MD. THE SYSTEM'S PERFORMANCE WILL BE EVALUATED AND THE SYNETICS COMPUTER SIMULATION MODEL USED IN THE PHASE I FEASIBILITY STUDY VERIFIED. UPON COMPLETION OF THE EFFORT THE DEMONSTRATION SYSTEM WILL BE TURNED OVER TO THE GOVERNMENT, AND A FINAL REPORT SUBMITTED.

SYNETICS CORP NAVY
80 MAIN ST
READING, MA 01867
CONTRACT NUMBER:
PAUL PAKOS
TITLE:
TRAINING COST ESTIMATION DECISION SUPPORT SYSTEM
TOPIC# 169 OFFICE: NAVAIR/NTSC

THE NAVAL TRAINING SYSTEM CENTER, CODE 123, ECONOMIC ANALYSIS BRANCH, IS FREQUENTLY CALLED UPON TO ASSES THE NON-DOLLAR (E.G., HUMAN, FACILITIES, EQUIPMENT ETC.) RESOURCES ASSOCIATED WITH TRAINING SYSTEM ALTERNATIVES. DURING PHASE I OF THIS PROJECT SYNETICS DEVELOPED A CONCEPTUAL FRAMEWORK, DATA MODEL AND COMPANION MICRO-COMPUTER-BASED SYSTEM TO DEMONSTRATE THE FEASIBILITY OF SUPPORTING THIS DECISION MAKING PROCESS. THE DEMONSTRATION SYSTEM DETERMINED THE RESOURCE REQUIREMENTS, AVAILABILITY AND SHORTFALLS ASSOCIATED WITH THE VARIOUS ALTERNATIVE APPROACHES. THIS DATA BASE CAN BE EXAMINED FROM EITHER A PROGRAM MANAGER'S PERSPECTIVE (I.E., COSTS BY MAJOR CLAIMANT OR APPROPRIATION OR RESOURCE CATEGORY) OR A TRAINING SYSTEM DEVELOPER'S PERSPECTIVE (I.E., RESOURCE UTILIZATION, COST PER STUDENT HOUR SUMMARY, ETC.) AND PROVIDES A COMMON COMMUNICATIONS FRAMEWORK FOR ALL PARTIES. THE PHASE II SYSTEM WILL GREATLY AUTOMATE THE TRADEOFFS ASSESSMENTS PERFORMED AND WILL ALSO PROVIDE SYSTEM USERS WITH PRODUCTS THAT WILL BE USED FOR DEFENDING THE SELECTED TRAINING SYSTEM DELIVERY METHODS. IT WILL ALSO PROVIDE MANAGEMENT VISIBILITY INTO THE EFFECTIVE USE OF BOTH CAPITAL ASSETS

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AND PRECIOUS ANNUAL FUNDS TO EFFECTIVELY DELIVER TRAINING SYSTEMS.

SYNTRO CORP ARMY
10655 SORRENTO VALLEY RD
SAN DIEGO, CA 92121
CONTRACT NUMBER:
DR RICHARD D MacDONALD
TITLE:
DEVELOPMENT OF A MALARIA VACCINE USING RECOMBINANT HERPESVIRUS
TOPIC# 212 OFFICE: MEDICAL

MALARIA IS ONE OF THE MOST IMPORTANT PARASITIC DISEASES OF MAN. RECENTLY, SEVERAL PLASMODIUM GENES HAVE BEEN CLONED THAT HAVE BEEN SHOWN TO CODE FOR ANTIGENS PRESENTED BY BOTH SPOROZOITES AND MEROZOITES. THESE ANTIGENS HAVE BEEN EXPRESSED IN BACTERIA AND SOME OF THEM ARE UNDERGOING CLINICAL TRIALS AS CANDIDATES FOR SUBUNIT VACCINES. SYNTRO HAS DEVELOPED THE TECHNOLOGY FOR ATTENUATING HERPESVIRUSES AND FOR USING THESE VIRUS VECTORS FOR THE EXPRESSION OF FOREIGN GENES. DURING PHASE I WE DEMONSTRATED THE FEASIBILITY OF APPLYING THIS TECHNOLOGY TO THE DEVELOPMENT OF A MALARIA VACCINE. WE CREATED SEVERAL ATTENUATED PSEUDORABIES VIRUS CONSTRUCTIONS THAT EXPRESSED THE MAJORITY OF THE CS PROTEIN OR ITS REPEATING IMMUNO-DOMINANT EPITOPE IN INFECTED CELL CULTURES. THESE VIRUSES WERE THEN INJECTED INTO WEANLING PIGS IN ORDER TO EVALUATE THEIR ABILITY TO RAISE AN IMMUNE RESPONSE TO THE CLONED CSP ANTIGEN. WHILE THIS ANALYSIS IS NOT YET COMPLETE, PRELIMINARY EVIDENCE INDICATES THAT AT LEAST ONE CONSTRUCTION INDUCED ANTIBODY FORMATION AS DETECTED BY WESTERN BLOTTING TO THE R32tet32 ANTIGEN. WE HAVE THUS DEMONSTRATED THE FEASIBILITY OF USING RECOMBINANT HERPESVIRUSES TO DELIVER MALARIA ANTIGENS IN VIVO. IN PHASE II WE WILL EXTEND THESE RESULTS AND DEVELOP A HERPES DELIVERY SYSTEM THAT CAN BE USED TO EVALUATE PRO-TECTION IN A MOUSE MODEL AGAINST P BERGHEI. THE ULTIMATE AIM OF THIS PROJECT IS TO DEVELOP A HERPES VECTOR SUITABLE FOR VACCINATION OF HUMANS.

SYSTEMS ENGINEERING INC NAVY
7833 WALKER DR - STE 308
GREENBELT, MD 20770
CONTRACT NUMBER:
DR WILLIAM H BENNETT
TITLE:
AI EXPERT SYSTEM FOR MODELING AND DESIGN OF COMPOSITE MATERIALS
TOPIC# 144 OFFICE: NWSC/SPPO

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THE OBJECTIVE OF THIS PROJECT IS TO DEVELOP A COMPUTER AIDED DESIGN SYSTEM--SPECIFICALLY, AN "EXPERT SYSTEM"--FOR MODELING AND ANALYSIS OF THE BEHAVIOR OF STRUCTURES FABRICATED FROM COMPOSITE MATERIALS. IN PHASE I, SEI DEVELOPED A PROTOTYPE SOFTWARE SYSTEM USING THE HOMOGENIZATION METHODOLOGY TO EVALUATE THE MODULI OF ELASTICITY OF METAL AND RESIN MATRIX-FIBER-REINFORCED MATERIALS. IN PHASE II, WE PROPOSE TO EXPAND OUR PREVIOUS WORK TO DEVELOP A COMPREHENSIVE CAD DESIGN SYSTEM. WE PROPOSE TO ENCOMPASS A WIDER RANGE OF PHYSICAL PHENOMENA IN THE SYSTEM INCLUDING VISCOELASTICITY AND THERMO-PLASTICITY PROPERTIES OF METAL MATRIX COMPOSITES, FATIGUE AND STRENGTH PROPERTIES, AND DAMPING AND WAVE PROPAGATION PROPERTIES. TO TEST AND EVALUATE THE CAD SYSTEM, WE PLAN TO USE IT TO DESCRIBE THE DYNAMICAL BEHAVIOR OF SIMPLE TRUSS STRUCTURES MADE FROM COM-POSITES. THE PRIMARY CHALLENGE WILL BE TO USE THE ANALYTICAL TOOLS TO COMPUTE PHENOMENA LIKE THE EFFECTIVE DAMPING INTRODUCED INTO THE TRUSS BY THE DAMPING IN THE (MOLDED) JOINTS AND CROSS BRACES.

SYSTOLIC SYSTEMS INC SDIO
2240 N FIRST ST - #6
SAN JOSE, CA 95131
CONTRACT NUMBER:
RICHARD H TRAVASSOS
TITLE:
KALMAN FILTER ARCHITECTURE FOR BATTLE MANAGEMENT
TOPIC# 9 OFFICE:

WITH RECENT DEVELOPMENTS IN ADVANCED SENSORS, A SEVERE LOAD HAS BEEN PLACED UPON REAL-TIME SIGNAL PROCESSING SYSTEMS TO PROCESS LARGE AMOUNTS OF DATA. ONE APPROACH IS THE USE OF HIGHLY PARALLEL OR SYSTOLIC SIGNAL PROCESSING ARCHITECTURES WHICH ARE WELL SUITED FOR RECURSIVE FILTERING, TARGET TRACKING, IMAGE PROCESSING AND SIGNAL PROCESSING. THE PARALLEL ARCHITECTURES BEING RESEARCHED ARE BASED ON MAPPING THE WIDELY USED KALMAN FILTER EQUATIONS ONTO A GENERALIZED SYSTOLIC ARRAY FOR LINEAR AND NONLINEAR PARALLEL COMPUTATION. UNDER THE PREVIOUS RESEARCH PHASE, THE POTENTIAL WAS DEMONSTRATED OF DE-COUPLING THE PREDICTOR AND CORRECTOR EQUATIONS IN THE KALMAN FILTER FOR PARALLEL COMPUTATION. IN THE CURRENT RESEARCH EFFORT, THE DE-COUPLING PRINCIPLE IS BEING EXTENDED FROM LINEAR TO NONLINEAR PARALLEL KALMAN FILTER ALGORITHMS AND ARCHITECTURES. AN EXPERT SYS-TEM BASED ON QUANTITATIVE PROCESS THEORY IS BEING INCORPORATED INTO

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THE PARALLEL KALMAN FILTER TO ENSURE STABILITY AND CONVERGENCE OF THE FILTER WHILE IMPROVING ESTIMATION ACCURACY. A STATE-OF-THE-ART TEST BED FACILITY BASED ON INDUSTRY STANDARD HARDWARE AND SOFTWARE IS BEING CREATED WHOSE PARALLEL ARCHITECTURE CAN BE RAPIDLY CONFIGURED TO MATCH THE UNIQUE COMPUTATIONAL NEEDS OF THE PARALLEL KALMAN FILTER ALGORITHM DEVELOPED. THE INTEGRATION OF THESE EMERGING TECHNOLOGIES, WHEN SUCCESSFULLY DEMONSTRATED, WILL PROVIDE A GENERAL SYSTOLIC KALMAN FILTER PROCESSOR THAT CAN BE USED AS A TEST BED FACILITY TO VALIDATE RAPIDLY NEWLY DEVELOPED PARALLEL ALGORITHMS AND ARCHITECTURES FOR SENSOR TRACK PROCESSING AS THEY EMERGE.

SYSTRAN CORP AF
4126 LINDEN AVE
DAYTON, OH 45432
CONTRACT NUMBER:
SRIVATHSAN VENKATARAMAN
TITLE:
INVESTIGATION OF ADVANCED TITANIUM ALUMINIDE MECHANICAL BEHAVIOR UNDER ENGINE OPERATING CONDITIONS
TOPIC# 158 OFFICE: AFWAL/ML

ORDERED INTERMETALLIC TITANIUM ALUMINIDE Ti3Al WITH NIOBIUM POSSESSES ATTRACTIVE HIGH TEMPERATURE PROPERTIES AND MODERATE LOW TEMPERATURE DUCTILITY, BUT APPLICATION IS LIMITED TO STATIC COMPONENTS IN AIRCRAFT GAS TURBINE ENGINES. TO EXTEND THEIR USE TO ROTATING PARTS OF TURBINE ENGINES, BETTER UNDERSTANDING OF LIFE LIMITING PROCESSES SUCH AS CREEP/FATIGUE CRACK GROWTH AND FRACTURE IS REQUIRED. PHASE II RESEARCH INVOLVES INVESTIGATION OF MECHANICAL BEHAVIOR OR ALPHA TWO TITANIUM ALUMINIDE UNDER ENGINE OPERATING CONDITIONS. TIME AND CYCLE DEPENDENT CRACK GROWTH BEHAVIOR WILL BE EVALUATED AS A FUNCTION OF FREQUENCY, STRESS LEVEL, LOAD RATIO, TEMPERATURE AND ENVIRONMENT. CRACK INITIATION IN THE ALLOY WILL BE STUDIED AT ELEVATED TEMPERATURES. INTERACTION BETWEEN ENVIRONMENT AND MATERIAL DUCTILITY WILL ALSO BE DETERMINED. MECHANICAL TESTING WILL BE CONDUCTED IN BOTH AIR AND VACUUM ENVIRONMENTS USING A SERVO-HYDRAULIC MTS TESTING MACHINE UNDER COMPUTER CONTROL. DETAILED FRACTOGRAPHIC ANALYSIS OF ALL FRACTURE SPECIMENS USING A SCANNING ELECTRON MICROSCOPE IS ALSO PLANNED. RELATIONSHIPS BETWEEN THE MICROSTRUCTURE AND FRACTURE MORPHOLOGY WILL BE EVALUATED. EVALUATED. A COMPARISON BETWEEN THE AIR AND VACUUM TEST DATA WILL

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BE MADE TO UNDERSTAND ENVIRONMENTAL INFLUENCE.

TACAN AEROSPACE CORP AF
2111 PALOMAR AIRPORT RD - STE 100
CARLSBAD, CA 92008
CONTRACT NUMBER: F19628-86-C-0185
MICHAEL M SALOUR
TITLE:
INTEGRATED FIBER OPTIC THEORY INTO INTEGRATED CIRCUIT TECHNOLOGY
TOPIC# 40 OFFICE: ESD/XRCT

AS THE GEOMETRIES OF VERY LARGE-SCALE INTEGRATED CHIPS GROW SMALLER AND DENSER, AND AS COMPUTATIONS BECOME FASTER AND MORE COMPLEX, THE CAPACITY OF ELECTRIC CIRCUITS IS BEING OUTSTRIPPED. THE CONNECTIONS SIMPLY CANNOT HANDLE ELECTRIC SIGNALS FAST ENOUGH AND RELIABLY ENOUGH. IN ADVANCED SYSTEMS, THE POWER DRAIN AND THE SHEER NUMBERS OF THE WIRES LINKING THE CHIPS, AND LINKING THE CIRCUIT BOARDS, IS PROHIBITIVE. CONNECTING CIRCUITS BY LIGHT INSTEAD OF BY ELECTRIC SIGNALS PROMISES RELIEF. UNDER PHASE II OF THIS SBIR PROGRAM, WE PLAN TO EXPERIMENTALLY DEMONSTRATE INTEGRATED OPTICAL WAVEGUIDES THAT ALLOW OPTICAL CHANNELS TO BE INCORPORATED WITHIN OPTE-ELECTRONIC DEVICES AND PACKAGES. IN ADDITION WE WILL EXPLORE THEORETICALLY THE FULL POTENTIAL OF INTRABOARD OPTICAL INTERCONNECTIONS WHEN OPTO-ELECTRONIC COMPONENTS ARE INTEGRATED MONOLITHICALLY WITH HIGH SPEED ELECTRONICS. THIS ANALYSIS WILL PROVIDE DIRECT CLUES TOWARD ELIMINATION OF THE EXCESS CAPACITANCE AND INDUCTANCE OF BONDING PADS AND WIRES WHICH SHOULD RESULT IN MONOLITHIC COMBINATIONS THAT OPERATE FASTER, USE LESS POWER, AND PRODUCE LESS NOISE THAN THE PRESENT HYBRIDS.

TAYLOR DEVICES INC AF
90 TAYLOR DR
NORTH TONAWANDA, NY 14120
CONTRACT NUMBER:
DOUGLAS P TAYLOR
TITLE:
DEEP BASE ISOLATION SYSTEM ANALYSIS
TOPIC# 240 OFFICE: LMO/MYSC

A KEY REQUIREMENT IN THE DEVELOPMENT OF THE DEEP BASE WEAPON SYSTEM

SUBMITTED BY DEPT

IS THE NEED TO COMBINE THE ELEMENTS OF BASING DEPTH, SHOCK ISOLATION, AND HARDENING TECHNIQUES TO INSURE SYSTEM SURVIVABILITY WHILE MAINTAINING COST EFFECTIVENESS. THE EFFORT DESCRIBED WITHIN THIS PROPOSAL PRIMARILY CONSISTS OF DEVELOPING A MATHEMATICAL MODEL FOR THE SHOCK ISOLATION SYSTEMS THAT PROTECT DEEPLY BASED SUBSYSTEMS. THE FUNCTION OF THE MODEL WILL BE TO PROVIDE DETAILED COST INFORMATION FOR SUBSEQUENT TRADE STUDIES. THE MODEL WILL PROVIDE PRECISE INFORMATION ON ISOLATION SYSTEM ENVELOPE, RATTLE SPACE, AND COST AS A FUNCTION OF SUPPORTED WEIGHT, DEGREE OF ISOLATION, AND SUBSYSTEM TYPE. THE CONCEPT OF ON-BOARD VS. OFF-BOARD ISOLATION FOR MOBILE SUBSYSTEMS WILL ALSO BE ADDRESSED, AS WILL THE FLAMMABILITY OF SILICONE OIL IN OXYGEN RICH ATMOSPHERES. SPECIFIC CONSIDERATION WILL BE GIVEN TO THE TOPIC OF PERMISSABLE SHOCK ATTENUATION LEVELS FOR DEEP BASE PERSONNEL, TO ALLOW PERFORMANCE OF DESIGNATED JOB TASKS IN THE PRESENCE OF WEAPONS GRADE SHOCK.

TECHNICAL RESEARCH ASSOCS AF
410 CHIPETA WY - STE 222
SALT LAKE CITY, UT 84108
CONTRACT NUMBER: F33615-87-C-5303
GAIL BOWERS-IRONS
TITLE:
BIOEXTRACTION OF GALLIUM/GERMANIUM ORE
TOPIC# 171 OFFICE: AFWAL/ML

TECHNICAL RESEARCH ASSOCIATES PROPOSES IN A PHASE II PROGRAM TO FURTHER STUDY AND DEVELOP TO COMMERCIALIZATION THE BIOLEACHING OF GALLIUM. GALLIUM IS WIDELY SCATTERED IN LOW CONCENTRATIONS AND IS OFTEN CONSIDERED A BY-PRODUCT OF PRINCIPAL METAL EXTRACTION. TODAY, DUE TO A FIRMING OF THE RARE EARTH MARKET, IT IS NO LONGER ECONOMICALLY ADVISABLE TO IMPORT GALLIUM WHEN THE US CAN PROCESS OUT LOW GRADE DOMESTIC RESIDUES. ALSO, FURTHER MICROBIAL INQUIRY WILL INITIATE NEW MATERIALS RESEARCH, BROADEN THE TECHNOLOGICAL AND SCIENTIFIC ELEMENT BASE AND LEAD TO POTENTIAL NEW DISCOVERIES AND ADVANCES. WITH THE ADVENT OF HIGH GRADE MINERAL RESOURCE DEPLETION AND NEW ENVIRONMENTAL COSTS, BIOLEACHING WILL BE AN AVAILABLE, NON POLLUTION METHOD THAT IS BOTH APPLICATION AND COST EFFECTIVE.

TECHNICAL RESEARCH ASSOCS ARMY
410 CHIPETA WY - STE 222
SALT LAKE CITY, UT 84108
CONTRACT NUMBER:
DR STEPHEN PETERSON
TITLE:
ELECTRONICALLY STEERABLE AGILE BEAM ANTENNA
TOPIC# 113 OFFICE: TACOM/AMSTA

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TRA PROPOSES TO DESIGN, BUILD AND TEST AN ELECTRONICALLY STEERABLE AGILE BEAM ANTENNA, ESABA, FOR USE IN TACOM/DARPA'S AGVT PROGRAM. THE "SMART" ANTENNA LISTENS TO A RECEIVED SIGNAL, DETERMINES ITS SIGNAL STRENGTH AND DIRECTION AND THEN SELECTS ONE OF THE SEVERAL ANTENNAS IN THE ARRAY TO ESTABLISH THE BEST COMMUNICATIONS LINK. THIS MEASUREMENT AND SELECTION PROCESS OCCURS IN MIRCOSECONDS AND CONTINUOUSLY, MAKING THE ANTENNA IDEAL FOR USE ON MOVING VEHICLES. ESABA WORKS WITH NO MOVING PARTS AND BECAUSE OF ITS HIGH DIRECTIVITY MAXIMIZES THE COMMUNICATION LINK WHILE AT THE SAME TIME MINIMIZING THE PROBABILITY OF ENEMY INTERCEPT. THE ESABA CAN BE USED ON BOTH THE RCC AND RCV. DEPENDING ON BANDWIDTH REQUIREMENTS A SINGLE ESABA MAY PROVIDE COMMUNICATIONS BETWEEN THE RCC AND MORE THAN ONE RCV.

TECHNICAL SOLUTIONS INC ARMY
PO BOX 1148
MESILLA PARK, NM 88047
CONTRACT NUMBER:
DR ALTON L GILBERT
TITLE:
NEXT GENERATION VIDEO TRACKER TECHNOLOGY
TOPIC# 170 OFFICE: TECOM/WSMR

VIDEO TRACKING HAS EVOLVED OVER THE PAST FIFTEEN YEARS FROM SIMPLE CONTRAST TRACKERS TO MORE COMPLEX AND "INTELLIGENT" TRACKING SYSTEMS BASED UPON SCENE INTERPRETATION AND OBJECT IDENTIFICATION METHODS. RESEARCH IN THE PAST DECADE IN AUTOMATIC TARGET RECOGNITION AND REAL-TIME TRACKING METHODS HAS PRODUCED A NEW GENERATION OF ALGORITHMS APPROPRIATE TO THE TRACKING REQUIREMENT. WHILE SOME OF THE ALGORITHMS ARE PROPRIETARY AND THE CLOSELY GUARDED SECRETS OF COMPANIES RESPONSIBLE FOR THEIR DEVELOPMENT, A VERY LARGE PERCENTAGE ARE IN THE PUBLIC DOMAIN. THESE ALGORITHMS ARE THE TOOLS BY WHICH THE TRACKING FUNCTION CAN BE PERFORMED. WSMR IS A NATIONAL LEADER IN TRACKING TECHNOLOGY, BUT THE ALGORITHMS EMPLOYED IN THE REAL-TIME VIDEO TRACKER ARE OVER TEN YEARS OLD, AND MANY IMPROVED "IMAGE INTERPRETATION" ALGORITHMS EXIST THAT WILL FURTHER EXTEND THE RTV CLASS OF TRACKING SYSTEM. TSI WILL PERFORM RESEARCH UNDER THIS CONTRACT TO SURVEY EXISTING TRACKER ARCHITECTURES, DEVELOP A CONCEPTUAL DESIGN OF A MODERN TRACKER ARCHITECTURE, SYNTHESIZE TRACKER ALGORITHM REQUIREMENTS, AND IDENTIFY AND EVALUATE EXISTING ALGORITHMS AND EMERGING RESEARCH RESULTS AGAINST THESE CRITERIA. A REPORT WILL

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BE PREPARED THAT SUMMARIZES ALL OF THE RELEVANT INFORMATION, IN TECHNICAL REPORT FORMAT, SUITABLE FOR DISTRIBUTION INTERNAL TO THE GOVERNMENT. SINCE MUCH OF THE TARGET RECOGNITION WORK IS BASED UPON WEAPONS SYSTEMS APPLICATIONS, A PORTION OF THE FINAL REPORT WILL PROBABLY BE CLASSIFIED.

TECHNOLOGY DEVELOPMENT ASSOCS INC DNA
992 OLD EAGLE SCHOOL RD - STE 910
WAYNE, PA 19087
CONTRACT NUMBER: DNA88-C-0026
NICHOLAS J DISPENZIERE
TITLE:
RV COMPOSITE MATERIAL/PAYLOAD NH&S INVESTIGATION
TOPIC# 5 OFFICE: AM

THE NEED TO REDUCE REENTRY VEHICLE (RV) WEIGHT HAS BECOME A CRITICAL ISSUE FOR ADVANCED SYSTEMS. IMPOSED REQUIREMENTS HAVE BEEN INCREASED TO THE POINT WHERE THE RV DESIGNER MUST LOOK TO THE BENEFITS AFFORDED BY HIGH STRENGTH-TO-WEIGHT MATERIALS SUCH AS GRAPHITE EPOXY. THE PHASE I PROGRAM SHOWED THAT UTILIZATION OF THESE COMPOSITE MATERIALS IN REGIONS OF THE RV WHERE PHYSICAL IMPACT OF VAPORIZED MATERIAL FROM INTERNAL COMPONENTS WAS PERMITTED IS FEASIBLE. PHASE II EXPANDS UPON THE RESULTS DERIVED IN PHASE I AND, IN ADDITION, ADDRESSES THE REMAINING STRUCTURAL ISSUES, I.E., AEROSHELL/COMPONENT STRUCTURAL AT TSR RESPONSE, NECESSARY TO FORMALIZE THE METHODOLOGY REQUIRED TO INCORPORATE ADVANCED COMPOSITE MATERIALS AS RV INVESTIGATIONS TO FORMULATE THE METHODOLOGY. EXPERIMENTATION IS DIRECTED TOWARD ACQUIRING BOTH MATERIAL SHOCK PERFORMANCE DATA AND DATA SPECIFICIALLY RELATED TO THE LOADING PHENOMENON.

TECHNOLOGY FOR ENERGY CORP ARMY
PO BOX 2296 - 1 ENERGY CTR/LEXINGTON DR
KNOXVILLE, TN 37933
CONTRACT NUMBER:
JAMES C ROBINSON
TITLE:
A PROTOTYPE INSTRUMENT FOR DETERMINING GRAIN SIZE IN POLYCRYSTALLINE MATERIALS UTILIZING ON-LINE X-RAY DIFFRACTION TECHNIQUES
TOPIC# 132 OFFICE: LABCOM/MTL

SUBMITTED BY DEPT

TECHNOLOGY FOR ENERGY CORPORATION (TEC) HAS COMPLETED A SIX-MONTH PHASE I SMALL BUSINESS INNOVATIVE RESEARCH PROJECT FOR THE UNITED STATES ARMY. THIS WORK ESTABLISHED PARAMETERS REQUIRED FOR GRAIN-SIZE MEASUREMENT BY X-RAY DIFFRACTION AND COMPLETED PROOF-OF-PRINCIPLE TESTING ON VARIOUS POLYCRYSTALLINE MATERIALS. PHASE I PROVIDED RESULTS CONSISTENT WITHIN ONE ASTM STANDARD NUMBER OF GRAIN SIZE CALCULATED BY OTHER METHODS. PHASE II WILL ADVANCE THE PHASE I RESEARCH BY DEVELOPING A PROTOTYPE GRAIN-SIZE DETERMINATION INSTRUMENT AND ESTABLISHING ITS OPERATING CHARACTERISTICS. THIS PROTOTYPE WILL BE THE BASIS OF A COMMERCIAL INSTRUMENT HAVING LABORATORY AND INDUSTRAL APPLICATIONS.

TECHNOLUBE PRODUCTS AF
5814 E 61ST STREET
LOS ANGELES, CA 90040
CONTRACT NUMBER:
ROBERT E PRATT
TITLE:
DEVELOPMENT OF PERSISTENT CHEMICAL WARFARE UPTAKE SIMULANTS
TOPIC# 274 OFFICE: AMD/RDO

THE OBJECTIVE OF THIS PROPOSED PROGRAM IS TO PROVIDE CHLOROFLUORO SUBSTITUTED CANDIDATE MATERIALS AS PERSISTENT CHEMICAL WARFARE UPTAKE SIMULANTS. BASED ON PREVIOUS EXPERIENCE WITH CHLOROPENTAFLUOROBENZENE (CPFB), WHICH IS A LEADING CANDIDATE FOR NONPERSISTENT UPTAKE SIMULANTS, AS WELL AS POLYCHLOROFLUOROBENZENE COMPOUNDS PREPARED UNDER PHASE I OF THIS PROGRAM, SUFFICIENT TECHNICAL PROGRESS HAS BEEN MADE TO WARRANT FURTHER INVESTIGATIONS OF POLYCHLOROFLUOROAROMATIC AND POLYCHLOROFLUOROALIPHATIC COMPOUNDS FOR THE DEVELOPMENT OF CANDIDATE SIMULANT AGENTS. BASED ON THE PRELIMINARY DATA OBTAINED, THE POLYCHLOROPERFLUORO COMPOUNDS SHOULD POSSESS EXCELLENT DETECTABILITY BY ELECTRON CAPTURE DETECTION USING GAS CHROMATOGRAPHIC ANALYSIS, BIOLOGICAL INERTNESS AND DESIRABLE VAPOR PRESSURE. THE CLASSES OF COMPOUNDS TO BE INVESTIGATED UNDER PHASE II ARE THE FOLLOWING: 1) CHLORO AND BROMO SUBSTITUTED PERFLUOROALKYLETHER COMPOUNDS; 2) POLYCHLORINATED PERFLUOROARYL COMPOUNDS; 3) PERFLUORALKYLETHER SUBSTITUTED PERFLUOROARYL COMPOUNDS; 4) PERFLUOROALKYL AND PERFLUOROARYL NITROGEN COMPOUNDS. THE CANDIDATE MATERIALS WILL BE SYNTHESIZED IN 10-20 GRAM QUANTITIES AND THE MORE PROMISING ONES WILL BE PREPARED IN UP TO 100 GRAM QUANTITIES. ANOTHER OBJECTIVE OF THIS

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PROGRAM IS TO OPTIMIZE THE SCALE UP SYNTHESIS PROCESSES TO BE AMENABLE FOR PILOT PLANT OPERATIONS BY INDUSTRIAL CONCERNS UNDER PHASE III.

TECHNOLUBE PRODUCTS AF
5814 E 61ST ST
LOS ANGELES, CA 90040
CONTRACT NUMBER: F33615-87-C-5328
ROBERT E PRATT
TITLE:
DEVELOPMENT OF SYNTHETIC LIQUID LUBRICANTS FOR SPACE
TOPIC# 167 OFFICE: AFWAL/ML

THE OBJECTIVE OF THE PROPOSED INVESTIGATION IS TO DEVELOP LIQUID SPACE LUBRICANTS OF HIGH VISCOSITY INDEX, A KINEMATIC VISCOSITY OF 100-150 cs AT 40 DEG C, GOOD COMPATIBILITY WITH BEARING MATERIALS, AND A VAPOR PRESSURE OF <<10(-9) mm Hg AT 20 DEG C, E.G. A BOILING POINT >>255 DEG AT 1 mm Hg. THE MATERIALS ARE TO EXHIBIT HIGH THERMAL STABILITY, ANTIWEAR CHARACTERISTICS, GOOD PERFORMANCE UNDER BOUNDARY LUBRICATION, AND SHOULD RESPOND TO NORMAL ADDITIVIES. UNDER THE PHASE I PROGRAM, CANDIDATE SILAHYDROCARBON ARRANGEMENTS WERE IDENTIFIED, PRECURSOR SYSTEMS WERE SYNTHESIZED, AND THE FEASIBILITY OF END-PRODUCT SYNTHESIS WAS ESTABLISHED. BASED ON THESE RESULTS AND THE BEHAVIOR OF THE SEMI-MODEL SYSTEMS PRODUCED, THE SYNTHETIC EFFORTS UNDER THE ENVISIONED PHASE II PROGRAM WILL BE DIRECTED AT DEVELOPMENT OF LUBRICANT COMPOSITIONS EXHIBITING THE OPTIMUM VISCOSITY TEMPERATURE CHARACTERISTICS WHILE MEETING OR EXCEEDING THE LOW VOLATILITY REQUIREMENTS. AT LEAST TWO CANDIDATES WILL BE FINALLY SELECTED a) 100 cs AT 40 DEG C; b) 150 cs AT 40 DEG C. ONE QUART OF FULLY FORMULATED BATCHES OF THESE TWO LUBRICANTS AND ONE PINT EACH OF BASE FLUIDS WILL BE PREPARED AND DELIVERED FOR EVALUATION BY THE AIR FORCE. ANOTHER OBJECTIVE OF THE PROGRAM IS TO OPTIMIZE AND SCALE-UP SYNTHESIS PROCESSES SO AS TO BE AMENABLE TO PILOT PLANT OPERATIONS UNDER PHASE III.

TELECOMMUNICATION SCIENCE ASSOCS INC DNA
2560 1ST AVE - STE 105
SAN DIEGO, CA 92103
CONTRACT NUMBER: DNA87-C-0146
RICHARD P BUCKNER
TITLE:
INVESTIGATION OF FREQUENCY EFFECTS ON VLF/LF CIRCUITS OPERATING IN NUCLEAR ENVIRONMENTS
TOPIC# 2 OFFICE: AM

SUBMITTED BY DEPT

RECENT DNA INVESTIGATIONS HAVE IDENTIFIED VLF/LF TRANSMISSION FREQUENCY AS A SIGNIFICANT PARAMETER INFLUENCING WWMCCS/MEECN LONG-WAVE COMMUNICATIONS EFFECTIVENESS. PHASE I OF THIS PROJECT DEMONSTRATED THE FEASIBILITY OF DETERMINING THE EFFECTS OF FREQUENCY SELECTION IN BENIGN AND NUCLEAR ENVIRONMENTS, AND CREATED COMPUTER MODELS FOR THE ANALYSIS OF BOTH TE AND TM PROPAGATION IN THE NORTHERN HEMISPHERE, WITH SPECIAL CONSIDERATION OF FREQUENCY EFFECTS ON WWMCCS AIRBORNE TRANSMISSIONS. PHASE II WILL BE ACCOMPLISHED IN THREE PARTS. PART 1 WILL CONDUCT RESEARCH AND DEVELOPMENT TO APPLY THE RESULTS OF PHASE I TO THE INVESTIGATION OF BASIC PHENOMENOLOGY EFFECTS IN NUCLEAR ENVIRONMENTS. PART 2 WILL DEFINE COMMUNICATIONS EFFECTIVENESS OVER EACH FREQUENCY BAND OF INTEREST TO THE WWMCCS AIRBORNE RESOURCES. INCLUDED IN THE LATTER EFFORT WILL BE DETERMINATION OF "BEST" AND WORST-CASE" FREQUENCIES FOR EACH WWMCCS SOURCE AND EACH EXPECTED ENVIRONMENT. IN PART 3 OF THE PHASE II PROGRAM, TECHNIQUES FOR MITIGATING THE EFFECTS OF FREQUENCY CHANGE UNDER HOSTILE THREAT SCENARIOS WILL BE INVESTIGATED AND PERFORMANCE IMPROVEMENTS WILL BE IDENTIFIED, BASED ON THE BASIC NUCLEAR PHENOMENOLOGY IDENTIFIED BY THIS INVESTIGATION.

TEXAS RESEARCH INSTITUTE INC NAVY
9063 BEE CAVES RD
AUSTIN, TX 78733
CONTRACT NUMBER:
DR CECIL M TELLER
TITLE:
NDE OF ADHESIVE BONDS
TOPIC# 6 OFFICE: ONR

CONTRACTOR TO DEVELOP NDE METHOD TO EVALUATE ELASTOMER-RUBBER ADHESION BY USE OF LEAKY LAMB WAVE TECHNIQUE.

THERMACORE INC SDIO
780 EDEN RD
LANCASTER, PA 17601
CONTRACT NUMBER:
JOHN ROSENFELD
TITLE:
TWO PHASE COOLING OF OPTICS
TOPIC# 1 OFFICE:

SUBMITTED BY DEPT

CURRENT HIGH POWER LASER OPTICS SYSTEMS PROPOSED FOR USE IN GROUND-BASED AND SPACE-BASED DEFENSE APPLICATIONS UTILIZE A PUMPED, SINGLE PHASE COOLANT TO PROVIDE THERMAL CONTROL OF THE MIRROR FACE SHEET. AS LASER POWER AND MIRROR SIZE INCREASE, THE EFFECTIVENESS OF SINGLE PHASE BECOMES LIMITED. TWO PHASE COOLING IS AN ALTERNATE MIRROR THERMAL CONTROL TECHNIQUE. THROUGH THE USE OF TWO PHASE HEAT TRANSFER, SUBSTANTIAL REDUCTIONS IN COOLANT FLOW RATE AND PUMP SIZE COULD BE ACHIEVED. UNDER THE PREVIOUS RESEARCH PHASE, THE USE WAS EVALUATED OF THE LATENT HEAT OF VAPORIZATION OF A WORKING FLUID TO COOL HIGH-POWERED OPTICS. THIS APPROACH IS EXPECTED TO LEAD TO SIGNIFICIANT REDUCTIONS IN PUMPING POWER REQUIREMENTS, SYSTEM MASS, AND MIRROR JITTER. SEVERAL CONCEPTS WERE GENERATED FOR IMPLEMENTATION OF ACTIVE TWO PHASE COOLING IN A SILICON MIRROR AND EVALUATIONS WERE PERFORMED ON EACH OF THE CONCEPTS TO DETERMINE THEIR RELATIVE ADVANTAGES. DESIGNS FOR SMALL SCALE PROTOTYPE MIRRORS UTILIZING TWO OF THE CONCEPTS WERE COMPLETED AND PARTS DRAWINGS PRODUCED. DURING THE CURRENT RESEARCH EFFORT THESE PROTOTYPES ARE BEING FABRICATED AND THERMALLY TESTED IN AN ATTEMPT TO FURTHER DELINEATE THE MORE ADVANTAGEOUS OF THE TWO. COMMERCIAL APPLICATIONS FOR ACTIVELY COOLED OPTICS, WHEN SUCCESSFULLY DEMONSTRATED, SEEM LIMITED, E.G., THE COOLING OF PRINTED CIRCUIT BOARDS AND SIMILAR ELECTRONIC COMPONENTS.

THERMACORE INC AF
780 EDEN RD
LANCASTER, PA 17601
CONTRACT NUMBER:
JOHN S SETNAR
TITLE:
HEAT PIPE FURNACE ELEMENT AND EPITAXY SUSCEPTOR DEVELOPMENT
TOPIC# 51 OFFICE: RADC/DOR

THE PURPOSE OF THE PROPOSED PROGRAM IS TO COMPLETE THE DEVELOPMENT OF A HEAT PIPE FURNACE ELEMENT FOR THE BULK GROWING OF HIGH PURITY SINGLE CRYSTAL SEMICONDUCTORS. THE PROGRAM ALSO INCLUDES THE DEVELOPMENT OF AN EPITAXY SUSCEPTOR FOR THE FABRICATION AND PROCESSING OF HIGH PURITY SINGLE CRYSTAL SEMICONDUCTORS. THE PRIMARY SEMICONDUCTOR MATERIALS FOR WHICH THIS EQUIPMENT IS BEING DEVELOPED ARE GALLIUM-ARSENODE AND INDIUM-PHOSPHIDES. THE INTENT IS TO USE HEAT PIPE TECHNOLOGY TO REDUCE TEMPERATURE GRADIENTS DURING THE PROCESSING AND GROWING OF THE CRYSTALS. THE BASIC TECHNOLOGY AND TECHNICAL FEASI-

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BILITY WERE DEMONSTRATED IN PHASE I. THE PHASE II PROGRAM WILL START BY IDENTIFYING THE REQUIREMENT FOR BOTH THE FURNACE ELEMENT AND THE BASIS FOR THE DESIGN, FABRICATION, AND TESTING OF VARIOUS HEAT PIPE FURNACE ELEMENTS AND HEAT PIPE EPITAXY SUSCEPTORS. THE PHASE II WORK WILL RESULT IN THE FABRICATION OF A ZONE, A LABORATORY SCALE CRYSTAL GROWING FURNACE, AND THE FABRICATION OF A FULL SCALE EPITAXY SUSCEPTOR. THESE DEVICES WILL BE TESTED IN ACTUAL CRYSTAL GROWING EQUIPMENT AND SEMICONDUCTOR WAFER PROCESSING EQUIPMENT FOR THE PURPOSES OF DEMONSTRATING THEIR CAPABILITY OF MEETING THE DESIGN REQUIREMENTS AND THE NEEDS OF THE SEMICONDUCTOR INDUSTRY.

THERMACORE INC NAVY
780 EDEN RD
LANCASTER, PA 17552
CONTRACT NUMBER:
BRYAN C HOKE JR
TITLE:
PASSIVE VARIABLE THERMAL RESISTANCE TECHNIQUES
TOPIC# 145 OFFICE: NWSC/SSPO

THE OVERALL OBJECTIVE OF THIS PROGRAM IS TO DEVELOP A VARIABLE CONDUCTANCE HEAT PIPE (VCHP) USED IN THE COOLING SYSTEM FOR A 26.4 WATT ELECTRONIC DEVICE OF A STRATEGIC NAVAL SYSTEM. THE VCHP MAINTAINS THE ELECTRONIC DEVICE AT NEARLY A CONSTANT TEMPERATURE WHILE THE HEAT SINK TEMPERATURE VARIES. THE ELECTRONIC DEVICE IS TO BE MAINTAINED AT 100 +/- 1 DEG F WHILE THE HEAT SINK TEMPERATURE VARIES BETWEEN 30 DEG F AND 85 DEG F. THIS PROPOSAL DOCUMENTS A PHASE II WORK PLAN TO DEVELOP AND FABRICATE VHCP'S FOR THIS APPLICATION. THE FEASIBILITY OF VCHP'S FOR THIS APPLICATION WAS PROVEN BY TEST DURING THE PHASE I EFFORT. UNDER THE PHASE I PROGRAM, THERMACORE DESIGNED, FABRICATED, AND TESTED A NOVEL VCHP THAT MAINTAINED THE HEAT SOURCE AT 97 +/- 2 DEG F WHILE THE HEAT SINK WAS VARIED BETWEEN 32 AND 86 DEG F. THE VCHP IS PASSIVE, REQUIRING NO EXTERNAL CONTROL POWER IN ITS OPERATION. TO OUR KNOWLEDGE, NO PASSIVE VCHP HAS PREVIOUSLY PROVIDED A TURNDOWN RATIO AS HIGH AS 54:4 UNDER THESE CONDITIONS. THESE RESULTS DEMONSTRATE THAT THIS DESIGN HAS THE POTENTIAL FOR SATISFYING THE COOLING NEEDS OF MANY TEMPERATURE SENSITIVE DEVICES WITHOUT EXPENDING CONTROL POWER.

TOYON RESEARCH CORP AF
75 AERO CAMINO - STE A
GOLETA, CA 93117
CONTRACT NUMBER:
MARK T FENNELL
TITLE:
BOMBER/BGV REQUIREMENTS FOR THE SRT MISSION
TOPIC# 94 OFFICE: ASD/XR

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IN THIS PHASE II SBIR ACTIVITY, TOYON WILL DEVELOP SYSTEM-LEVEL REQUIREMENTS FOR A PROMISING OPERATIONAL CONCEPT DESIGNED TO HOLD SOVIET MOBIL MISSILES AT RISK. THE CONCEPT CALLS FOR THE BOMBER FORCE TO USE AIR-LAUNCHED BOOST GLIDE VEHICLES (BGVs) TO PERFORM THE INITIAL TARGET-SEARCH MISSION TO BE FOLLOWED BY BOMBER ATTACK OF ANY DETECTED TARGETS. THE FIRST PHASE OF THE STUDY SHOWED THE UTILIZTY OF SEARCHING FROM A FAST, HIGH-ALTITUDE PLATFORM EQUIPPED WITH A SAR, SUCH AS THE BGV. HOWEVER, THE TARGET AND SCENARIO CHARACTERISTICS WERE TREATED PARAMETRICALLY AS WAS THE DISCRIMINATION CAPABILITY OF THE SENSOR AND AUTO-TARGET RECOGNIZER (ATR). THUS, THE LOGICAL EXTENSION OF PHASE II IS TO GATHER REALISTIC DATA, (FROM THE INTELLIGENCE COMMUNITY AS WELL AS FROM INDUSTRY AND GOVERNMENT LABS) AND USE IT TO DEFINE THE REQUIREMENTS OF THE BOMBER/BGV CONCEPT. AN ADDITIONAL OUTPUT OF THIS ACTIVITY WILL BE THE QUANTIFIED EFFECTIVENESS IMPROVEMENT REALIZED OVER THE SELF-CONTAINED BOMBER FORCE.

TOYON RESEARCH CORP AF
PO BOX 6890
SANTA BARBARA, CA 93160
CONTRACT NUMBER:
JOEL GARBARINO
TITLE:
NUCLEAR EFFECTS ON THREAT SENSORS
TOPIC# 266 OFFICE: BMO/MYSC

THE IMPROVEMENT OF THREAT SENSOR TECHNOLOGY IN THE PAST DECADE HAS RAISED QUESTIONS ABOUT CURRENT PENETRATION SYSTEMS EFFECTIVENESS. TAKING THE OFFENSE CONSERVATIVE VIEW OF THE PROBLEM CAN MAKE THE JOB OF THE PENETRATION AID DESIGNER VERY DIFFICULT. A MORE REALISTIC VIEW OF THE PROBLEM MAY SHOW THAT CERTAIN CONCEPTS HAVE MORE MERIT THAN THE CONSERVATIVE VIEW MIGHT INDICATE. THE IMPORTANT ASPECT OF THESE ENGAGEMENTS WHICH HAS NOT BEEN PREVIOUSLY CONSIDERED IS THE IMPACT OF NUCLEAR EFFECTS ON DEFENSE PERFORMANCE AND THE CONCOMITANT IMPROVEMENT IN PENETRATION SYSTEM PERFORMANCE. SINGLE RADAR (BLACKOUT) AND OPTICAL SENSOR (REDOUT) ANALYSES HAVE BEEN CONSIDERED IN SOME CASES TO DETERMINE LIKELY DEFENSE INTERCEPTOR BURST PLACEMENT, BUT THE IMPACT ON DEFENSE TRACKING AND DISCRIMINATION PERFORMANCE HAS NOT BEEN TREATED. IN THIS ACTIVITY, AN EXAMINATION OF THESE ISSUES WOULD BE TREATED WHICH WOULD LEAD TO AN UNDERSTANDING OF IMPORTANT

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EFFECTS, INDICATE HOW THESE EFFECTS MIGHT IMPACT PEN-AIDS DESIGN REQUIREMENTS, AND LEAD TO THE DEVELOPMENT OF A METHODOLOGY (AND ULTIMATELY A SMALL COMPUTER CODE) FOR DETERMINING PENETRATION EFFECTIVENESS AND DESIGN TRADEOFF WITH REALISTIC DEFENSE LIMITATIONS DUE TO NUCLEAR EFFECTS.

TRACER TECHNOLOGIES INC NAVY
20 ASSEMBLY SQUARE DR
SOMERVILLE, MA 02145
CONTRACT NUMBER:
DR FRASER WALSH
TITLE:
A LASER-BASED METHOD FOR COATING METALS WITH A SILICON-CONTAINING CERAMIC
TOPIC# 117 OFFICE: NSWC/SSPO

THE PROPOSED PROGRAM RELATES TO THE DEVELOPMENT OF A PROTOTYPE WORK STATION FOR A PROCESS SHOWN TECHNICALLY FEASIBLE IN A PHASE I PROGRAM. THE PROCESS IS TO FORM A PROTECTIVE ADHERENT CERAMIC LAYER ON METALS BY USING A Nd:YAG LASER TO HEAT ACTIVATE THE METAL SURFACE IN THE PRESENCE OF SILICON-RICH RADICALS FORMED BY CO(2)-LASER BASED MIRPD OF AN ORGANOSILANE. IN PHASE I, THE CERAMIC LAYER FORMED IN THIS PROCESS WAS SHOWN TO SIGNIFICANTLY REDUCE CORROSION IN A HCl ELECTROLYTE AND OXIDATIVE DECAY ON TEMPERATURE CYCLING IN AIR TO 900 DEG C. THE DEVELOPMENT IN PHASE II OF A PROTOTYPE WORK STATION WILL PERMIT COATING OF LARGE METAL PARTS OF SYSTEMS OF INTEREST TO THE NAVY, AND FACILITATE THEIR TESTING TO DEMONSTRATE RESISTANCE TO CORROSION AND THEMALLY-INDUCED OXIDATIVE DECAY. THE PROGRAM APPROACH IS TO DESIGN, MAKE AND USE A PROTOTYPE WORK STATION FOR FORMING AN ADHERENT CERAMIC LAYER ON METAL PARTS; CERAMIC-COATED METAL PARTS PREPARED USING THE PROTOTYPE WORK STATION WILL BE TESTED FOR THERMAL STRESS AND CORROSION RESISTANCE. SURFACE MORPHOLOGY AND CHEMISTRY WILL BE EXAMINED BY SEM AND AUGER PROFILE ANALYSIS.

TRANSFORM INDEX TECHNOLOGIES INC AF
PO OX 290428 - 8961 TESORO DR
SAN ANTONIO, TX 78217
CONTRACT NUMBER: F33615-87-C-0624
P NICHOLAS LAWRENCE
TITLE:
APPLICATIONS OF AUTOMATED MULTICHANNEL DATA ANALYSIS CAPABILITY TECHNOLOGY
TOPIC# 282 OFFICE: AMD/RDO

SUBMITTED BY DEPT

IN THE PHASE I PROJECT, "THE ANALYSIS OF PSYCHOPHYSIOLOGICAL MEASUREMENT TO SUPPORT BIOFEED-BACK CONTROL MECHANISMS", A SOFTWARE SYSTEM WAS BUILT AND DEMONSTRATED WHICH MAKES CORRECTIONAL/FACTOR TYPE ANALYSIS OF LARGE DATA BASES PRACTICAL ON MICROCOMPUTER-CLASS MACHINES, AND IS ABLE TO COMPUTE THE SIGNIFICANCE OF PSYCHOPHYSIO-LOGICAL MEASUREMENTS AT A SPEED THAT MAKES REAL TIME FEEDBACK CONTROL MECHANISMS POSSIBLE. THE SUCCESS OF THIS PROJECT STRONGLY SUGGESTS A GENERALIZATION OF THE SOFTWARE SYSTEM INTO A GENERIC MULTICHANNEL DATA ANALYSIS CAPABILITY WITH BROAD APPLICATIONS. THE PHASE II PRO-JECT WILL DEVELOP COMMERCIALLY USEFUL IMPLEMENTATIONS OF THE SOFTWARE DEMONSTRATED IN PHASE I AND INVESTIGATE THE GENERALIZATION IN SPECIFIC AREAS OF INTEREST TO THE AIR FORCE AND TO NON-FEDERAL FUND-ING SOURCES WHO HAVE EXPRESSED INTEREST. THESE AREAS SPECIFICALLY INCLUDE THE APPLICATION AREA OF PHASE I EXPANDED TO INCLUDE CARDIO-VASCULAR DISEASE RISK MODIFICATION PROGRAMS, ELECTROCARDIOVASCULAR BEAT CLASSIFICATION AND RECONNAISSANCE AND INTELLIGENCE ANALYSIS.

TRIBOLOGY CONSULTANTS INC AF
504 FOXWOOD LN
PAOLI, PA 19301
CONTRACT NUMBER: F33615-87-C-2830
LEWIS B SIBLEY
TITLE:
SOLID LUBRICATED BALL/CAGE CONTACT SIMULATION
TOPIC# 187 OFFICE: AFWAL/PO

USING THE SPECIAL TEST FIXTURE CONCEPTS PROVEN FEASIBLE IN PHASE I, THE TEST RIG FOR SIMULATION OF SOLID LUBRICATED BALL/CAGE CONTACTS WILL BE MODIFIED TO OPERATE AT HIGH TEMPERATURE AND SPEED SIMULATING ADVANCED TURBINE APPLICATIONS. BALL/RACE TRACTION AND CAGE/RACE FRICTION AND WEAR MEASUREMENTS, AND REFINEMENTS OF THE DYNAMIC RE-SPONSE AND INTERACTIONS DATA ON SOLID FILM BALL/CAGE/RACE SURFACE CONTACT PHENOMENA, WILL BE ADDED TO THE RIG DESIGN. THE LATEST CANDIDATE HIGH-TEMPERATURE CAGE MATERIALS FROM GENERAL TECHNOLOGY, AS WELL AS FROM OTHER SOURCES, WILL BE TESTED IN THE NEW FIXTURE TO EXPLORE SYNERGISTIC EFFECTS BETWEEN THE CAGE, CERAMIC TRACKS AND NATURALLY OCCURRING DOUBLE OXIDE LUBRICANTS AS SPEED AND TEMPERATURE ARE INCREASED. IN THIS WAY, THE HIGH TEMPERATURE LIMIT OF THE BEST SOLID LUBRICANT CAGE MATERIALS IS EXPECTED TO APPROACH 1500 F OR HIGHER, AND THE REQUIRED DATA TO DEVELOP EMPIRICAL CAGE FRICTION

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AND WEAR MODELS FOR RELIABLE LONG-LIFE SOLID LUBRICATED CERAMIC BEARINGS WILL BE OBTAINED. THESE MODELS WILL THEN BE INCORPORATED INTO ADVANCED DYNAMIC BEARING COMPUTER ANALYSIS CODES, SUCH AS ADORE, TO GUIDE THE IMPROVED DESIGN AND MANUFACTURE OF A HALF DOZEN PROTOTYPE BEARINGS FOR A TYPICAL ADVANCED TURBINE APPLICATION.

TTL TECHNIQUES NAVY
65 LIMEKILN PIKE
GLENSIDE, PA 19038
CONTRACT NUMBER:
JIM SCHAEFFER
TITLE:
ADVANCED PACKAGING ASSEMBLY FOR VLSI DEVICES
TOPIC# 149 OFFICE: NWSC

PHASE II RESEARCH EFFORT WILL BE CONCERNED WITH THE FIVE (5) MAJOR AREAS: TWO ALTERNATIVE ALUMINUM NITRIDE DEPOSITION PROCESSES, COST EFFECTIVE FABRICATION PROCESSES, DESIGN OF SPECIAL LOW COST FABRICATION AND IN-PROCESS TEST EQUIPMENT, DESIGN AND TESTING OF A LOW COST DISSIPATIVE TEST AND BURN-IN CARRIERS, ELECTRICAL DESIGN AND CHARACTERIZATION OF 50 Ohm PACKAGE TRANSMISSION ELEMENTS. TWO TYPES OF ALUMINUM NITRIDE DEPOSITION PROCESSES WILL BE EVALUATED; VACUUM PLASMA TORCH SPRAYING AND MAGNETRON SPUTTER-UP. MAGNETRON SPUTTER DEPOSITION WOULD HAVE A DEPOSITION RATE APPROXIMATELY 100 TIMES GREATER THAN THE REACTIVE SPUTTER DEPOSITION EVALUATED IN PHASE I. THE FABRICATION PROCESS, WHICH WILL BE DEVELOPED, WILL BE COST EFFECTIVE IN THE RANGE OF 1 TO 1,000 PRODUCTION UNITS. FIFTY Ohm PACKAGE TRANSMISSION IMPEDANCE WILL BE DEVELOPED IN ORDER TO MAXIMIZE DEVICE DENSITY AND OPTIMIZE POWER TRANSFER.

UFA INC AF
335 BOYLSTON ST
NEWTON, MA 02159
CONTRACT NUMBER: F33615-88-C-1720
DR ARTHUR GERSTENFELD
TITLE:
EXPERT SYSTEM MANAGEMENT SYSTEM (ESMS)
TOPIC# 116 OFFICE: AFWAL/AA

SUBMITTED BY DEPT

THE PURPOSE OF THIS PHASE II PROJECT IS TO GO FROM A FEASIBILITY STUDY TO A WORKING PROTOTYPE OF AN EXPERT SYSTEM MANAGEMENT SYSTEM. THIS PROTOTYPE WILL BE INTEGRATED IN THE INTELLIGENT TEST BED AT WPAFB. EACH OF SEVERAL PILOT JOBS WILL HAVE SEPARATE EXPERT SYSTEMS. HOWEVER, TO PERFORM EACH OF THESE JOBS THE INDIVIDUAL EXPERT SYSTEMS MUST COMMUNICATE WITH ONE ANOTHER AND INTERACT WITH THE PILOT THROUGH THE EXPERT SYSTEM MANAGEMENT SYSTEM. THE VALUE OF THE EXPERT SYSTEM MANAGEMENT SYSTEM IS THAT IT WILL BE POSSIBLE TO VERY RAPIDLY EVALUATE HUGE AMOUNTS OF DATA FROM A LARGE NUMBER OF SUBSYSTEMS, ASSESS AND RECOGNIZE THE CURRENT SITUATION, AND THEN CONSULT ITS STORED KNOWLEDGE BASE AND RULE BASE TO DETERMINE ALTERNATIVE COURSES OF ACTION FOR THAT SITUATION. THE DELIVERABLE PRODUCT WILL BE A WORKING PROTOTYPE THAT CAN BE USED IN THE INTELLIGENT TEST BED AT WPAFB.

ULTRAMET NAVY
12173 MONTAGUE ST
PACOIMA, CA 91331
CONTRACT NUMBER:
RICHARD B KAPLAN
TITLE:
STABILIZED HIGH TEMPERATURE OXIDES BY CVD
TOPIC# 153 OFFICE: NAVAIR/NADC

NEW DESIGNS FOR GAS TURBINES, ROCKET MOTORS, AND OTHER AEROSPACE COMPONENTS REQUIRE EVER-INCREASING OPERATING TEMPERATURES IN ORDER TO ATTAIN THE BENEFITS OF INCREASED POWER AND EFFICIENCY. THESE DESIGNS ARE CURRENTLY LIMITED BY THE AVAILABILITY OF MATERIALS WHICH CAN OPERATE AT THESE TEMPERATURES. THE MOST PROMISING HIGH TEMPERATURE STRUCTURAL MATERIALS FOR THE YEAR 2000 AND BEYOND, AS IDENTIFIED BY THE AIR FORCE, ARE NIOBIUM ALLOYS AND CARBON MATERIALS. THE LIMITATION OF THESE MATERIALS IS THEIR POOR HIGH TEMPERATURE OXIDATION RESISTANCE; BOTH READILY ABOVE 500 DEG C. STATE-OF-THE-ART PROTECTIVE COATINGS WILL NOT MEET THE TEMPERATURE AND LIFETIME REQUIREMENTS. THE HIGH TEMPERATURE COMPOSITES INITIATIVE MATERIALS COMPATIBILITY WORKSHOP HELD BY THE AIR FORCE IN OCTOBER 1985 IDENTIFIED HAFNIA (HfO(2)) AS A KEY COMPONENT IN THE DEVELOPMENT OF HIGH TEMPERATURE OXIDATION-RESISTANT COATINGS. UNFORTUNATELY, HAFNIA SUFFERS FROM A BASIC FLAW: A MARKED PHASE CHANGE ACCOMPANIED BY A VOLUME CHANGE, WHICH RESULTS IN CRACKING AND SPALLING. IN PHASE I, ULTRAMET DEMONSTRATED

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THE FEASIBILITY OF STABILING CHEMICALLY VAPOR DEPOSITED HAFNIA BY A UNIQUE CODEPOSITION TECHNIQUE USING AN UNCONVENTIONAL STABILIZER. IN PHASE II, ULTRAMET PROPOSES TO OPTIMIZE THE MATERIAL AND PROCESS AND DEMONSTRATE ITS CAPABILITIES AS AN OXIDATION-PROTECTIVE MATERIAL ON NIOBIUM ALLOYS AND CARBON COMPOSITES.

ULTRAMET ARMY
12173 MONTAGUE ST
PACOIMA, CA 91331
CONTRACT NUMBER:
RICHARD B KAPLAN
TITLE:
COATED TUNGSTEN POWDERS FOR ADVANCED ORDNANCE APPLICATIONS
TOPIC# 129 OFFICE: LABCOM/MTL

IMPROVED TUNGSTEN COMPOSITE "ALLOYS" ARE NECESSARY FOR ADVANCED KINETIC ENERGY AND CHEMICAL ENERGY PENETRATION DEVICES. STATE-OF-THE-ART TUNGSTEN MATERIALS SUFFER FROM A NUMBER OF PROBLEMS, ALL OF WHICH ACT TO REDUCE TOUGHNESS, ENERGY ABSORPTION, ELONGATION (PLASTICITY), AND STRENGTH. THESE PROBLEMS WOULD BE GREATLY ALLEVIATED BY COATING TUNGSTEN PARTICLES WITH A DESIRABLE MATRIX MATERIAL; THIS WOULD IMPROVE HOMOGENEITY AND ELIMINATE PARTICLE-PARTICLE CONTACT (A MAJOR EMBRITTLING MECHANISM). IN PHASE I, ULTRAMET DEMONSTRATED THE ABILITY TO SUCCESSFULLY COAT TUNGSTEN PARTICLES, AND THAT THESE COATED PARTICLES COULD BE SINTERED BY CONVENTIONAL MEANS INTO AN EXTREMELY HOMOGENEOUS SPECIMEN, ALTHOUGH SINTERING PARAMETERS WERE NOT OPTIMIZED. THIS PHASE II PROPOSAL DESCRIBES EFFORTS TO CAPITALIZE ON AND EXTEND PHASE I ACHIEVEMENTS. THE GOALS OF PHASE II WILL BE TO DEMONSTRATE: IMPROVED PHYSICAL PROPERTIES OF COATED POWDERS INCLUDING REDUCED SCATTER BANDS, THE LATER LEADING TO IMPROVE PREDICTABILITY OF BALLISTIC PERFORMANCE. IMPROVED PERFORMANCE OF KE AND CE DEVICES ON AN EXPERIMENTAL SCALE (E.G. QUARTER SCALE PENETRATORS AND SMALL SHAPED CHARGE DEVICES).

UNIQUE MOBILITY INC NAVY
3700 S JASON ST
ENGLEWOOD, CO 80110
CONTRACT NUMBER:
DAVID D WRIGHT
TITLE:
DEVELOPMENT OF A ROBOTIC VEHICLE PLATFORM
TOPIC# 122 OFFICE: NSWC/SSPO

SUBMITTED BY DEPT

UNIQUE MOBILITY, INC. HAS BEEN VERY ACTIVE IN THE DESIGN AND FABRICATION OF HARDWARE COMPONENTS AND COMPOSITE BODY STRUCTURE FOR HIGH PERFORMANCE ROBOTIC PLATFORMS. UNIQUE'S CONCEPT FOR A FULL MOBILITY ROBOTIC PLATFORM HAS ALL WHEEL DRIVE AND ALL WHEEL 360 DEGREE STEERING. THE FULL MOBILITY VEHICLE IS MADE PRACTICAL BY THE USE OF HIGH POWER PROPRIETARY ELECTRIC MOTORS IN COMBINATION WITH A UNITIZED COMPOSITE BODY. THIS VEHICLE HAS THE POTENTIAL TO OUT-CORNER, OUT-CLIMB AND OUT-MANEUVER ANY KNOWN VEHICLE, AND WILL ACCOMMODATE A VARIETY OF ONBOARD PAYLOAD PACKAGES AND SENSOR SUITES. THE RESEARCH DESCRIBED HEREIN DEFINES A TETHERED ROBOTIC VEHICLE HAVING PERFORMANCE LEVELS SUITABLE TO NAVIGATE AN AREA AND TO COLLECT AND INTEGRATE SENSOR DATA IN SUPPORT OF FIRE FIGHTING OPERATIONS.

UNIVERSAL ENERGY SYSTEMS INC AF
4401 DAYTON-XENIA RD
DAYTON, OH 45432
CONTRACT NUMBER: F33615-87-C-2826
GARY D STREBY
TITLE:
PROTOTYPE DEVELOPMENT OF AN INFRARED THERMAL TOPOGRAPHIC ANALYSIS SYSTEM
TOPIC# 181 OFFICE: AFWAL/PO

INFRARED DETECTION OF THERMAL RADIATION GENERATED BY HEAT GENERATING DEVICES SUCH AS ENGINE COMBUSTORS CAN BE COMBINED WITH IMAGE AND DATA PROCESSING TO PROVIDE DETAILED THERMAL INFORMATION. THE THERMAL INFORMATION OBTAINED CAN BE PRESENTED AS THREE-DIMENSIONAL SURFACE PLOTS. SUCH DATA PLOTS YIELD CONSIDERABLE THERMAL INFORMATION OF THE THERMAL VARIATIONS OF THE OBJECT BEING OBSERVED. THIS TECHNIQUE YIELDS CONSIDERABLY MORE THEMAL DATA QUICKLY AND IS NON-INTRUSIVE. A THERMAL DATA ACQUISITION SYSTEM WITH THESE CAPABILILTIES WOULD REDUCE THE TIME AND MANHOURS NECESSARY TO CONDUCT EXTENSIVE THERMAL ANALYSIS OF ADVANCED ENGINE COMBUSTORS AND ASSOCIATED COMPONENTS. SUCH AN ANALYSIS SYSTEM WOULD FIND USE IN BOTH GOVERNMENT AND INDUSTRIAL APPLICATIONS.

UNIVERSITY RESEARCH ENGINEERS & ASSOCS ARMY
1554 SWALLOW WAY
HERCULES, CA 94547
CONTRACT NUMBER:
THOMAS F CALLAHAN
TITLE:
AN INNOVATIVE CONCEPT FOR A HIGH PERFORMANCE ELECTRIC POWER CABLE AND A METHOD FOR RAPID DEPLOYMENT
TOPIC# 98 OFFICE: BRDEC

SUBMITTED BY DEPT

ELECTRIC POWER DISTRIBUTION IS CRITICAL ON MODERN BATTLEFIELDS. A MISSION'S SUCCESS MIGHT TURN ON TIMELY DELIVERY OF CABLES TO A TACTICAL POSITION. CIRCUMSTANCES REQUIRING THAT CABLES BE DEPLOYED ABOVE GROUND LEAVE THEM VULNERABLE TO CRUSHING DAMAGE FROM VEHICLES. AN EXAMINATION OF OTHER BATTLEFIELD SCENARIOS, E.G., NBC (NUCLEAR, BIOLOGICAL, CHEMICAL) ENVIRONMENT OR ENEMY ACTIVITY SUGGEST THAT THE DELIVERY OF CABLES BY TRADITIONAL METHODS MIGHT BE IMPOSSIBLE. IN ADDITION, SOME TERRAIN (STEEP HILLS, CLIFFS/RAVINES, MARSHES) ALSO LIMIT THE CABLE DEPLOYMENT APPROACH TO AIRBORNE METHODS. A METHOD OF LAUNCHING THE CABLES THROUGH THE AIR AND OVER HAZARDOUS AREAS OR OTHER OBSTACLES HAS BEEN PROVEN FEASIBLE. THE APPROACH UTILIZES EXISTING WEAPON SYSTEMS AS THE CABLE LAUNCH AND CARRIER VEHICLE. THE PHASE I STUDY DISCLOSED A NUMBER OF PERFORMANCE DEFICIENCIES WITH STATE-OF-THE-ART POWER CABLE AND THUS REINFORCED THE CONCLUSION OF PREVIOUS FT. BELVOIR STUDIES. BECAUSE THE CABLE IS A CRITICAL COMPONENT IN MOBILE ELECTRIC POWER DISTRIBUTION AND THE RAPID DEPLOYMENT CONCEPT, THE PHASE I PROGRAM WAS EXPANDED TO INCLUDE THE DEVELOPMENT AND EVALUATION OF CREATIVE HIGH PERFORMANCE CABLE DESIGN CONCEPTS. THE PHASE II ACTIVITY WILL CONCLUDE WITH A DEMONSTRATION OF BOTH THE AIR LAUNCH APPROACH AND SAMPLE LENGTH OF HIGH PERFORMANCE ELECTRIC POWER CABLE.

VANCE SYSTEMS INC NAVY
3901 V BONANZA BLVD - DULLES BUS PK
CHANTILLY, VA 22021
CONTRACT NUMBER:
L MICHAEL LUMPKIN
TITLE:
LAN SYSTEM EMULATOR
TOPIC# 99 OFFICE: NSWC/SSPO

THIS PROPOSAL DEMONSTRATES THE REQUIREMENT FOR AND ADDRESSES THE DEVELOPMENT OF A MODEL OF AN IEEE 802.5 TOKEN PASSING BUS PROTOCOL WHICH OPERATES IN REAL TIME. THE ADVANTAGE OF THE REAL TIME APPROACH IS THAT IT EXTENDS THE EFFECTIVE LIFE OF THE MODEL TO INCLUDE NT ONLY THE SYSTEM DESIGN PHASE, BUT ALSO THE SYSTEM MODIFICATION AND UPGRADE PHASES WHICH TYPICALLY OCCUR DURING THE LIFE CYCLE OF MILITARY SYSTEMS. THE CHARACTERISTICS OF REAL TIME EXECUTION ALLOWS THE MODEL TO BE INTEGRATED INTO EXISTING SYSTEMS IN ORDER TO PERFORM NON-INTRUSIVE TESTING AND SYSTEM LOAD SIMULATIONS. THE TECHNICAL

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INNOVATION ASSOCIATED WITH THIS PROPOSAL IS THE USE OF A DEDICATED, HIGH SPEED PROCESSING ELEMENT WHICH PERMITS OPERATION OF THE MODEL IN REAL TIME.

VATELL CORP NAVY
PO BOX 66 - 910 CARDINAL DR
CHRISTIANSBURG, VA 24073
CONTRACT NUMBER:
LAWRENCE W LANGLEY
TITLE:
TERNARY CHORD KEYBOARD DEVELOPMENT
TOPIC# 94 OFFICE: NSWC/SSPO

DEVELOPMENT OF KEYBOARDS WHICH USE A COMBINATION OF TERNARY KEYS AND A STRAIGHTFORWARD CHORDING CONCEPT FOR EFFICIENT, ACCURATE DATA ENTRY IN MILITARY COMMAND-CONTROL APPLICATIONS. KEYBOARD CIRCUITS AS WELL AS SOFTWARE AND MECHANICAL COMPLEXITY ARE REDUCED, WHILE THE LEARNING PROCESS FOR OPERATORS IS ENHANCED AND SIMPLIFIED. EIGHT KEY KEYBOARDS WITH ALL THE FUNCTIONS NORMALLY REQUIRED FOR DATA ENTRY ARE CONSTRUCTED AND TESTED IN A SERIES OF ERGONOMIC EXPERIMENTS. KEYBOARD ATTRIBUTES WHICH AFFECT OPERATOR LEARNING RATE, FATIGUE, SPEED AND ACCURACY ARE OPTIMIZED IN A THREE-STAGE PROGRAM OF DESIGN, CONSTRUCTION AND TEST. SOFTWARE FOR OPERATOR TRAINING AND EVALUATION, AS WELL AS FOR USE OF THE KEYBOARD AS A DATA ENTRY DEVICE IS ALSO DEVELOPED AND TESTED.

VERAC INC AF
9605 SCRANTON RD - STE 500
SAN DIEGO, CA 92121
CONTRACT NUMBER: F33615-87-C-0016
DONALD KURPIEWSKI
TITLE:
TSAR/DYNA-METRIC GRAPHICS POST-PROCESSOR
TOPIC# 287 OFFICE: AMD/RDO

VERAC PROPOSES TO USE ITS EXTENSIVE COMPUTER SCIENCE AND SOFTWARE EXPERTISE TO DEVELOP THE SOFTWARE FOR A GRAPHICS POST-PROCESSOR FOR THE TSARINA/TSAR AND DYNA-METRIC MODELS. TO ACCOMPLISH THIS, VERAC WILL USE AS A GUIDE THE SOFTWARE DEVELOPMENT SPECIFICATION IT

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GENERATED DURING THE PHASE I EFFORT. THE GRAPHICS POST-PROCESSOR WILL BE HOSTED ON AN IBM PC COMPATIBLE MICROCOMPUTER AND WILL PROVIDE USER-DEFINED GRAPHICAL REPRESENTATION OF OUTPUT FROM THE TSARINA/TSAR AND DYNA-METRIC MODELS. VIDEO DISPLAY AND HARD COPY OUTPUT WILL BE SUPPORTED. VERAC HAS INTIMATE EXPERIENCE IN THE USE OF TSARINA/TSAR AND DYNA-METRIC AND RELATED MODELS IN SUPPORT OF RECENT AND CURRENT EFFORTS IN THE ANALYSIS OF AIRBASE SUPPORT OPERATIONS. IN ADDITION, VERAC HAS A STRONG CAPABILITY IN THE DESIGN AND DEVELOPMENT OF TURN-KEY COMPUTER SYSTEMS SUCH AS THE AIRFIELD DAMAGE ASSESSMENT SYSTEM (ADAS) AND THE ALL-MOBILE TACTICAL AIR FORCE (AMTAF) ANALYTICAL WORKSTATION WHICH FEATURE MENU-DRIVEN CAPABILITY, GRAPHICAL OUTPUT AND DATA BASE MANAGEMENT.

VERITAY TECHNOLOGIES INC ARMY
PO BOX 305 - 4845 MILLERSPORT HWY
EAST AMHERST, NY 14051
CONTRACT NUMBER:
ROBERT L TALLEY
TITLE:
LIQUID PROPELLANT GUN DIAGNOSTICS
TOPIC# 35 OFFICE: ARDEC/SMCAR

GUNS USING LIQUID PROPELLANTS (LPG) HAVE BEEN OF CONSIDERABLE INTEREST BECAUSE OF MAJOR OPERATIONAL ADVANTAGES, SUCH AS GREATER OUTPUT PER UNIT VOLUME, BETTER HANDLING QUALITIES, MORE EFFICIENT STORAGE, AND GREATER SAFETY. THESE ADVANTAGES ARE DIFFICULT TO REALIZE, HOWEVER, BECAUSE OF THE LACK OF UNDERSTANDING OF THE INTRICACIES OF THE IGNITION AND COMBUSTION PROCESSES. TO PROMOTE A BETTER UNDERSTANDING OF THESE PROCESSES, VERITAY HAS DEVELOPED SEVERAL DIAGNOSTIC TECHNIQUES UNDER PHASE I FUNDING. WE EXPECT TO MAKE ADDITIONAL ADVANCES UNDER THE NEW YORK STATE MATCHING FUNDS PROGRAM (WHICH IS DESIGNED TO BRIDGE THE FINANCIAL VOID BETWEEN PHASE I AND II). DOING SO WILL SET THE STAGE FOR THE PHASE II EFFORT OF THIS PROPOSAL, WHICH IS DESIGNED TO: (1) CONSOLIDATE AND EXTEND DIAGNOSTIC TECHNIQUES BEGUN IN PHASE I; AND (2) COORDINATE THE APPLICATION OF DIAGNOSTIC TECHNIQUES INTO SOLVING IGNITION AND COMBUSTION PROBLEMS NOW CURRENT IN DYNAMICALLY, REGENERATIVELY, AND STATICALLY LOADED LIQUID PROPELLANT GUNS.

VEXCEL CORP ARMY
2905 WILDERNESS PL
BOULDER, CO 80301
CONTRACT NUMBER:
DR FRANZ W LEBERL
TITLE:
SMART REAL-TIME CONTROL GENERATOR
TOPIC# 187 OFFICE: ETL/COE

SUBMITTED BY DEPT

THE REAL-TIME AUTOMATED REGISTRATION OF MULTI-SENSOR IMAGERY BEGINS WITH THE GENERATION OF CONTROL INFORMATION. THE SPECIFIC APPLICATION MAY REQUIRE THE REGISTRATION OF NEWLY ACQUIRED IMAGERY TO AN EXISTING SPATIAL DATABASE (ABSOLUTE REGISTRATION), OR SIMPLY TO OTHER IMAGES OF A SERIES (RELATIVE REGISTRATION). THIS WORK IS TO DEFINE AND EVALUATE THE BASIC FUNCTIONALITY OF A SYSTEM CAPABLE OF PROVIDING THE CONTROL INFORMATION REQUIRED FOR A RANGE OF IMAGE REGISTRATION TASKS AND IMAGE TYPES. IN GENERAL, THIS CONTROL GENERATION WILL BE GUIDED BY NAVIGATIONAL DATA AND/OR A SPATIAL DATABASE MAINTAINING INFORMATION ABOUT THE FEATURE CONTENT OF THE AREA OF INTEREST. THE USE OF A RULE-BASED QUERY GENERATOR TO EXTRACT CANDIDATE GROUND CONTROL OPTIMIZED FOR THE PARTICULAR IMAGE TYPE AND GEOMETRY AT HAND WILL BE STUDIED. THEORETICAL AND EMPIRICAL STUDY OF POTENTIAL METHODS OF MULTI-SENSOR AND INTER-SENSOR CONTROL GENERATION WILL BE THE MAJOR FOCUS OF THIS WORK.

VIGYAN RESEARCH ASSOCS INC AF
30 RESEARCH DR
HAMPTON, VA 23666
CONTRACT NUMBER: F33615-87-C-3020
R N GUPTA
TITLE:
LOW DENSITY FLOW EFFECTS FOR HYPERVELOCITY VEHICLES
TOPIC# 127 OFFICE: AFWAL/FI

UNDER PHASE I OF THIS STUDY, A PERFECT-GAS, TWO-DIMENSIONAL VISCOUS SHOCK-LAYER (VSL) CODE HAS BEEN DEVELOPED FOR APPLICATION TO THE HYPERSONIC VEHICLES FLYING AT HIGH ALTITUDE. THIS CODE ACCOUNTS FOR THE NONCONTINUUM EFFECTS NEAR THE SURFACE AND FINITE SHOCK THICKNESS DUE TO LOW DENSITY IN THE OUTER FLOW. IT IS VERY EFFICIENT AND ROBUST AND REMOVES THE INACCURACIES AND DEFICIENCIES OF THE EXISTING VSL CODES. THE PRESENT PHASE II WORK IS DIRECTED TOWARDS DEVELOPING A RELIABLE AND ACCURATE THREE-DIMENSIONAL VSL CODE. THIS CODE WILL HAVE THE CAPABILITY OF HANDLING CHEMICAL NONEQUILIBRIUM WITH FINITE CATALYTIC SURFACE AND HIGHLY TEMPERATURE-DEPENDENT TRANSPORT AND THERMODYNAMIC PROPERTIES FOR DISSOCIATED AIR UNDER THE LOW-DENSITY FLIGHT CONDITIONS.

VISTA CONTROLS INC ARMY
27825 FREMONT CT
VALENCIA, CA 91355
CONTRACT NUMBER:
RONALD L RAMBIN
TITLE:
ADVANCED ELECTRONIC CONTROL UNIT
TOPIC# 2 OFFICE: ARDEC/SMCAR

SUBMITTED BY DEPT

THIS PHASE II PROPOSAL IS TO BUILD AND DEMONSTRATE AN ADVANCED ELECTRONIC CONTROL UNIT INTEGRATED INTO THE ROBOTIC TECHNOLOGY DEMONSTRATOR OR OTHER M109 AUTOLOADER. PHASE II WILL BUILD DEMONSTRATOR HARDWARE FOR ARDEC SUITABLE FOR PROOF OF PRINCIPLE TESTING AND EVALUATION. THE ADVANCED ELECTRONIC CONTROL UNIT DESCRIBED IN THIS PROPOSAL WILL BE A SIGNIFICIANT ADVANCEMENT IN CONTROLS TECHNOLOGY. IT INCORPORATES A MODULAR DIGITAL APPROACH WHICH WILL BENEFIT DOD MISSIONS IN TERMS OF GENERALIZED APPLICABILITY, REDUCED SYSTEM DEVELOPMENT TIME, AND MINIMIZED SPARES REQUIREMENT.

VISTECH CONSULTANTS INC AF
1372 N FAIRFIELD RD
DAYTON, OH 45432
CONTRACT NUMBER: FQ8671-8601560
DR ARTHUR P GINSBURG
TITLE:
SUPERTHRESHOLD CONTRAST SENSITIVITY VISION TEST CHART
TOPIC# 10 OFFICE: AFOSR/XOT

VISUAL ACUITY HAS BEEN THE MAINSTAY OF MILITARY VISION STANDARDS SINCE 1913. SINCE THEN, HOWEVER, VISUAL ACUITY HAS BEEN SHOWN NOT TO RELATE WELL TO VISUAL PERFORMANCE. RECENTLY, CONTRAST SENSITIVITY USING SINE-WAVE GRATING HAS BEEN SHOWN IN THE LABORATORY, IN FLIGHT SIMULATORS, AND IN FIELD STUDIES TO RELATE TO INDIVIDUAL DIFFERENCES IN VISUAL TARGET DETECTION CAPABILITIES. ALTHOUGH TARGET DETECTION THRESHOLDS ARE AN IMPORTANT ASPECT OF PILOT VISUAL PERFORMANCE, MANY VISUAL TASKS IMPORTANT TO MILITARY CONSIDERATIONS ARE PERFORMED AT SUPRATHERSHOLD CONTRAST LEVELS. WE PROPOSE THAT A NEW VISION TEST CHART BE DEVELOPED TO MEASURE INDIVIDUAL DIFFERENCES IN SUPRATHERSHOLD CONTRAST PERCEPTION, AND TO SHOW HOW THEY RELATE TO PILOT PERFORMANCE. THIS SUPRATHRESHOLD CONTRAST SENSITIVITY TEST SYSTEM WILL USE THE PSYCHOPHYSICAL PROCEDURE OF CONTRAST MATCHING TO MEASURE AN INDIVIDUAL'S SUPRATHRESHOLD CONTRAST PERCEPTION OF SINE-WAVE GRATINGS FOR APPROPRIATE RANGES OF SPATIAL FREQUENCY AND CONTRAST. THE RESULTING DATA WILL PROVIDE AN ARRAY OF CURVES FROM JUST-ABOVE THRESHOLD TO HIGH SUPRATHERSHOLD, THEREBY ESTABLISHING A RANGE OF INDIVIDUAL SUPRATHERSHOLD VISUAL CAPABILITIES. THESE CURVES WILL BE SIMILAR TO THE LOUDNESS SENSITIVITY CURVES IN AUDITION. FOLLOW-UP RESEARCH WILL USE THESE VISION TEST CHARTS TO RELATE INDIVIDUAL DIFFERENCES IN SUPRATHERSHOLD CONTRAST SENSITIVITY TO AIR

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FORCE-RELATED PERFORMANCE TASKS.

X2Y2 CORP NAVY
1142 MANHATTAN AVE
MANHATTAN BEACH, CA 90266
CONTRACT NUMBER:
DR MURRAY F TEITELL
TITLE:
AN INTELLIGENT SYSTEM FOR ACQUIRING MANUFACTURING PLANNING EXPERTISE
TOPIC# 150 OFFICE: NWSC

THE TECHNICAL FEASIBILITY OF THE SYSTEM WAS DEMONSTRATED IN PHASE-I BY DEVELOPING (1) AN ARCHITECTURE FOR AN EXPERT SYSTEM FOR MANUFACTURING PLANNING, (2) AN ARCHITECTURE FOR A LEARNING SYSTEM FOR CAPTURING MANUFACTURING PLANNING EXPERTISE, AND (3) A MANUFACTURING PLANNING LANGUAGE FOR ENCODING THE PLAN. A DETAILED KNOWLEDGE-BASE FOR PLANNING THE MANUFACTURE OF A PRODUCT WAS DEMONSTRATED. DURING PHASE-II, IT IS PROPOSED THAT THIS TECHNICAL FEASIBILITY AND TRANSITION TO THE PRIVATE SECTOR AND THE FEDERAL GOVERNMENT WILL BE ACCOMPLISHED BY (1) CONSTRUCTION OF A RAPID PROTOTYPE OF THE PHASE-I DESIGN, (2) ANALYSIS OF THE REQUIREMENTS OF A DEFENSE-RELATED MANUFACTURING ENVIRONMENT (E.G. AN ORGANIZATION WHICH MANUFACTURES THE ELECTRONIC COMPONENTS FOR THE TRIDENT MISSILE), (3) REFINEMENT OF THE PROTOTYPE IN A DEFENSE-RELATED MANUFACTURING ENVIRONMENT (4) CONSTRUCTION OF A GRAPHICS SYSTEM TO DISPLAY SECTIONS OF THE MANUFACTURING PLAN (5) CONSTRUCTION OF THE FINAL PROTOTYPE (6) VALIDATION OF THE PROTOTYPE BY PROTOCOL DEMONSTRATIONS OF OBJECTIVES IN A DEFENSE-RELATED MANUFACTURING ENVIRONMENT AND (7) DELIVERY OF THE PROTOTYPE TO THE NAVY. PERFORMANCE MEASUREMENTS WILL BE DEVELOPED TO EVALUATE COMPLIANCE OF THE SYSTEM WITH CRITERIA. DURING THE REFINEMENT STEP, EMPHASIS WILL BE ON IMPROVING THE CONSTRUCTS OF THE "LEARNING SYSTEM", SPECIFICALLY, THE "DIALOGUER", THE "MODEL FOR EXCEPTION IDENTIFICATION", AND THE "KNOWLEDGE-BASED MODIFIER".

XEMET INC DARPA
7525 BOBBYBOYAR AVE
CANOGA PARK, CA 91304
CONTRACT NUMBER:
RICHARD B MINCH
TITLE:
HIGH CONDUCTIVITY MATERIALS
TOPIC# 6 OFFICE: DARPA

SUBMITTED BY DEPT

MATERIALS WITH THERMAL CONDUCTIVITIES ORDERS OF MAGNITUDE GREATER THAN COPPER ARE PROPOSED. HEAT-FLUXES ON THE ORDER OF 30 TO 40 KILOWATTS/SQUARE CENTIMETER ARE POSSIBLE. THE SYSTEM ANALYSIS, CONCEPTUAL ANALYSIS, AND DETAILED DESIGN ON THE HIGH-TEMPERATURE (500 - 1000 C) CLASS OF MATERIALS WAS COMPLETED IN PHASE I. THIS PROPOSAL INCLUDES LOW TEMPERATURE RANGES (0 TO 250 C). IT ALSO SHOWS THAT HEAT-FLUXES ON THE ORDER OF 20 KILOWATT-CENTIMETERS ARE POSSIBLE AT TEMPERATURES AS LOW AS -200 C. THE MATERIALS ALSO PERFORM WELL IN HIGH MAGNETIC FIELDS AND ACCELERATIVE FORCES. THE APPLICATION TO SEVERAL TECHNOLOGIES IS ANALYZED, INCLUDING VLSI COMPONENTS, MICROWAVE TUBES, RAILGUN RAILS, HIGH-POWER RF STRUCTURES, LASER MIRRORS, ELECTRON-BEAM COMPONENTS, MAGNETIC DEVICES AND CRYSTAL GROWTH. POTENTIAL APPLICATION MAY ALSO EXTEND TO IR DETECTOR ARRAYS. EACH PRODUCT APPLICATION IS ANALYZED IN TERMS OF THE UNIQUE PROPERTIES OF THESE MATERIALS. A DEVELOPMENT AND TEST PROGRAM IS PROPOSED WHICH INCLUDES INCORPORATION OF MATERIALS INTO SYSTEMS/COMPONENTS FOR TEST.

XMCO INC NAVY
11150 SUNRISE VALLEY DR
RESTON, VA 22091
CONTRACT NUMBER:
CHARLES J GARVEY
TITLE:
EXPLOSIVE ORDNANCE DISPOSAL ADVISOR SYSTEM (EODAS)
TOPIC# 165 OFFICE: NTSC/NAVSEA

THE ARMED SERVICES MAKE A SIGNIFICIANT INVESTMENT IN PERSONNEL CRUITING AND TRAINING TO PRODUCE QUALIFIED EXPLOSIVE ORDNANCE DISPOSAL (EOD) EXPERTS. BY ANY STANDARD, THE MISSION OF EOD PERSONNEL IS ONE OF THE MOST HAZARDOUS DURING WAR OR PEACETIME. CURRENT METHODOLOGIES TO RENDER MUNITIONS SAFE REQUIRE THE EOD EXPERT TO ENDANGER HIS OR HER LIFE IN MANY SITUATIONS. A REQUIREMENT CLEARLY EXISTS TO DEVELOP INNOVATIVE PROCESSES TO ENHANCE THE TRAINING OF THESE CRITICAL EXPERTS. THE PHASE I EFFORT INVESTIGATED THE FEASIBILITY OF DEVELOPING AN ARTIFICIAL INTELLIGENCE (AI) EXPERT SYSTEM TO ASSIST EOD SPECIALIST IN TRAINING. THE XMCO TEAM CONDUCTED EXTENSIVE RESEARCH INTO THE EOD AREA. DETAILED INTERVIEWS WERE CONDUCTED WITH SEASONED EOD EXPERTS. BASED ON THESE INTERVIEWS, A DEMONSTRATION EXPLOSIVE ORDNANCE DISPOSAL ADVISOR SYSTEM (EODAS) WAS DEVELOPED. THE MAJOR FINDING OF PHASE I IS THAT THE PHASE I OBJECTIVE IS

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FEASIBLE. THE TECHNOLOGY EXISTS TO DEVELOP AN EODAS, AND EOD TRAINING LENDS ITSELF TO THE ASSISTANCE OF COMPUTER SUPPORT AND AN AI EXPERT SYSTEM. XMCO NOW PROPOSES A PHASE II EFFORT. THE OBJECTIVES OF PHASE II ARE TO REFINE EODAS SOFTWARE REQUIREMENTS BASED ON NAVY FEEDBACK TO PHASE I, DESIGN EODAS ARCHITECTURE, DEVELOP SYSTEM SOFTWARE, DEVELOP EODAS SOFTWARE OPERATIONAL PROTOTYPE FOR TRAINING EOD SPECIALISTS, AND ESTABLISH SYSTEM SPECIFICATIONS AND DOCUMENTATION FOR SOFTWARE AND HARDWARE PROCUREMENT.

bd SYSTEMS INC AF
357 VAN NESS WY - STE 110
TORRANCE, CA 90501
CONTRACT NUMBER:
DR JOHN C BAKER
TITLE:
R/V TERMINAL UPDATE
TOPIC# 216 OFFICE: BMO/MYSC

A PRIMARY GOAL OF THE STRATEGIC POLICY OF THE UNITED STATES IS TO PROVIDE THE CAPABILITY TO ATTACK RELOCATABLE TARGETS FROM LONG RANGE. DURING OUR PHASE I EFFORTS WE IDENTIFIED A PROMISING TECHNIQUE FOR PUTTING RELOCATABLE TARGETS AT RISK. WE CALL THIS CONCEPT BiSARaH, FOR BISTATIC SYNTHETIC APERATURE RADAR HOMING. IN THIS CONCEPT A TRANSMITTER ON THE PBV ILLUMINATES THE AREA OF SUSPECTED TARGET LOCATIONS. THIS ALLOWS THE RECEIVER AND ITS ASSOCIATED PROCESSOR ON-BOARD THE R/V (WHICH OF NECESSITY WILL BE A MaR/V) TO LOCATE THE TARGET, GENERATE THE REQUIRED STEERING COMMANDS, AND DIRECT THE WAR-HEAD TO THE TARGET. THIS PHASE II EFFORT WILL DEVELOP A DETAILED SET OF REQUIREMENTS FOR THE EMPLOYMENT OF BiSARaH AGAINST RELOCATABLE TARGETS, GENERATE AN IN-DEPTH CONCEPT DESIGN, WITH PARTICULAR ATTENTION PAID TO THE REQUIRED COMPUTER ARCHITECTURE, INVESTIGATE THE NUCLEAR EFFECTS ON THE CONCEPT, AND DEVELOP DEMONSTRATION AND DEVELOPMENT PLANS.

bd SYSTEMS INC AF
357 VAN NESS WY - STE 110
TORRANCE, CA 90501
CONTRACT NUMBER: F04701-87-C-0131
MARGARET A POWER
TITLE:
SPECIFICATION OF EXPERT SYSTEMS
TOPIC# 67 OFFICE: AFSTC/OLAB

SUBMITTED BY DEPT

THE COMBINED PHASE I AND PHASE II EFFORT PROVIDES A SET OF FIVE GUIDEBOOKS AND A SHORT COURSE FOR MANAGEMENT OF EXPERT SYSTEMS PROCUREMENT, TAILORED TO THE NEEDS OF AIR FORCE SATELLITE SYSTEMS, BUT MODIFIABLE FOR OTHER MILITARY SYSTEMS AND COMMERCIAL APPLICATIONS. A KEY GOAL IS TO PRESERVE EXISTING SOFTWARE ENGINEERING DISCIPLINES TO THE EXTENT POSSIBLE, WHILE INCORPORATING MODIFICATIONS AS NECESSARY TO ACCOMMODATE THE UNIQUE REQUIREMENTS OF EXPERT SYSTEMS. PHASE I DEVELOPED VOLUME I, REQUIREMENTS ANALYSIS FOR EXPERT SYSTEMS, AND THE RELATED PORTION OF THE SHORT COURSE. PHASE II DEVELOPS THE REMAINING VOLUMES AND SHORT COURSE SEGMENTS; VOLUME II, EXPERT SYSTEM COATING; VOLUME III, EXPERT SYSTEM TESTING; VOLUME IV, TAILORING SOFTWARE SPECIFICATIONS FOR EXPERT SYSTEM; AND VOLUME V, SOURCE SELECTION EVALUATION STANDARDS FOR EXPERT SYSTEMS.

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